Council of European Energy Regulators
Working Group on Quality of Electricity Supply

SECOND BENCHMARKING REPORT ON QUALITY OF ELECTRICITY SUPPLY

September 2003

Autorità per l'energia elettrica e il gas

FOREWORD

Why Do Regulators Take Care of Quality?

As mentioned by Robert M. Pirsig in his book Lila, "Quality is the primary empirical reality of the World".

If such a definition is applied to energy markets, quality of service for final customers is what they really receive in exchange for the bill paid. Quality of course is made up of a number of different quality factors. In electricity supply, these factors include customer service issues, commercial relationships, continuity of supply, voltage quality, and others. Each customer has a different perception of quality; some quality factors can be objectively measured, while others cannot.

Economic regulation of utilities usually focuses on the promotion of competition and price regulation. Price regulation involves different incentives for quality of supply. In rate-of-return or cost-plus regulation, companies usually define their own investment and quality levels.

On the other hand, simple price-cap regimes could incentivise a regulated company to reduce its quality of supply by cutting investments, maintenance, or personnel with the aim of increasing its profits. Both rate-of-return and price-cap regulation have therefore to be accompanied by some kind of regulation of quality of supply, with the aim of avoiding distorted or excessive investment in the former case, and to prevent a decrease of quality in the latter.

Utility regulation must include a clear definition of the "product" supplied to the customer; price regulation without quality regulation may give unintended and misleading incentives to quality levels. Quality incentives can ensure that cost cuts are not achieved at the expense of lower quality. Where utilities are privatised, quality regulation is needed even more, because most of quality factors for electricity supply cannot be individually negotiated by final customers.

For all these reasons, Regulators increasingly take care of quality levels through appropriate standards, incentives and penalties. Performance-Based Regulation frequently includes quality incentives, even where price regulation was originally introduced without quality-saving or quality-promotion mechanisms.

The CEER Working Group on Quality of Supply

The Council of European Regulators Working Group on Quality of supply was set up to consider how quality of supply is regulated in EU countries and improve exchange of in-

formation among regulators in this field.

The general objectives of the Working Group are:

- Comparing strategies and experience in implementing quality of service regulation, including commercial quality, continuity of supply and voltage quality;
- Identifying and describing quality of service indicators and selecting possible comparators; and
- Performing benchmarking studies on quality of service.

In addition to internal-oriented activities, in 2001 the Working Group produced the Report *Quality of electricity supply: Initial benchmarking on actual levels, standards and regulatory strategies* (available at http://www.ceer-eu.org), and organized an international seminar on Regulation of electricity supply quality, with over 20 countries participating to the discussion (presentations available at http://www.autorita.energia.it/inglese/publications.htm).
WG activities and outcomes were, among other, presented and discussed during the following international conferences:

- 10th International Training Program on Utility Regulation and Strategy (University of Florida and World Bank);
- Roundtables on quality regulation at CIRED 2001 (Amsterdam) and 2003 (Barcelona) Conferences (Biannual Convention on Electricity Distribution Networks);
- CIGRE Group 36 2002 Session (International Council on Large Electric Systems, Paris).

The WG Report was widely mentioned both in the draft Communication from the Commission to the Council and the European Parliament *Completing the internal energy market* (COM[2001]125 final, Annex IV) and in the *First Report on the implementation of the internal electricity and gas market* (European Commission, SEC [2001]1957), and was also discussed and commented on by the European Federation of Public Service Trade Unions (ETSU).
In 2003 the group has been enlarged from the original six participants, to include Regulators from most European Union countries; the Working Group interests were also enlarged to include Public Service Obligations.

This Report

This Report is focused on comparison of commercial quality and continuity of supply actual levels and standards in different European countries. For this purpose, a survey was conducted among participating countries to collect relevant information. Only interna-

tionally comparable figures are presented in this report; information at national level are collected and made available by Regulators in each single country on a wider base. While international comparisons of electricity prices are frequently published by internationally organizations and research centres, less attention is paid to what customers really receive in exchange for the bill they pay. In reality, customers' satisfaction depends not only on prices, but also whether and how energy is supplied and the relationships with both the distributor and the supplier.

International benchmarking of quality levels for the main quality factors may help the understanding of consumers' satisfaction levels in different countries, and stimulate policy-makers to intervene where quality needs emerge.

This Report is the result of the joint activity of all participants. Una Brady (Ireland) drafted most of it; Luca Lo Schiavo (Italy) and Maria Jesús Gago Cornejo (Spain) developed both questionnaires and preliminary analysis on continuity of supply and commercial quality respectively.

Colleagues from Austria, Finland, France, Great Britain, Ireland, Italy, the Netherlands, Norway, Portugal, and Spain actively participated to the Working Group and supplied relevant information on their own country quality levels and standards, so that the analysis in this report is based on the information obtained from these ten countries.

Commercial quality levels and standards are compared in Chapter 1. Most of the information regarding commercial quality are based on national standards, because both individual and overall standards are the common regulatory tool in this field.

As continuity of supply is not usually regulated through the use of simple standards, but instead by using different systems of economic incentives and penalties, Chapter 2 on continuity of supply includes comparative analysis of available information on continuity levels, both in term of Customer minutes lost and the Number of interruptions per customer.

Chapter 3 contains the conclusions reached by the Working Group, and some suggestions for next steps.

Detailed benchmarking tables are presented in Annexes 1 and 2 respectively for commercial quality and continuity of supply.

Participants thank the CEER Chairman Jorge Vasconcelos and CEER members for their active role in promoting the Working Group and their interest in its activities.

Roberto Malaman

Chairman

CEER Working Group on Quality of supply

PARTICIPANTS

Officials from Austria, Belgium, Finland, France, Great Britain, Greece, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden participated in the activities of the Working Group.

Participants were as follows:

• Roberto Malaman (Chairman)	AEEG	Italy
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• Markku Kinnunen	EMV	Finland
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• José Afonso	ERSE	Portugal
• Maria Jesus Gago Cornejo	CNE	Spain
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In addition to those who participated in the Working Group, the following people contributed to the development of this report: Chris Watts (Great Britain), Antii Paananen (Finland), Roman Picard (France), Una Brady (Ireland), Priti Dave-Stack (Ireland) and Antonella Bertazzi (Italy).

CONTENTS

COMMERCIAL QUALITY

1.1 What is Commercial Quality?

Commercial quality relates to the nature and quality of customer service provided to electricity customers. In a liberalized electricity market this is complicated by the fact that supply and distribution are separated (the customer may not be served by a single integrated electricity utility but rather by separate Distribution and Supply companies), a distinction which is not always clear from the customer perspective[1]. Commercial quality is directly associated with transactions between electricity companies (both DSOs and Suppliers) and customers. The transactions include not only the sale of electricity, but also the contacts that are established between companies and new or existing customers. Before the beginning of supply, several transactions occur between a potential customer and the supplier/DSO such as connection and meter installation. These and later transactions during the contract can be made subject to a set of relevant quality factors which determine a company's performance.

Commercial transactions between a company and a customer may be classified as follows:

- Transactions related to conditions of distribution and supply such as information about connection to the network and prices associated with the supply. These transactions occur before the supply contract comes into force and incorporate transactions both with the DSO and the supplier. Generally, customer rights with regard to transactions related to these conditions are set out in Codes (such as Connection Agreements and the General Conditions of Supply Contracts) approved by the regulatory authority.
- Transactions which occur during the contract validity and which are implicitly purchased with the product itself, such as billing, payment arrangements and response to customers' queries and claims. These transactions can be divided into regular and occasional transactions. Regular transactions refer to transactions like billing and regular meter readings. Certain transactions between the company and the customer are only occasionally necessary, when the customer has a

1 Customers generally come into contact with the Distribution company (or Distribution System Operator (DSO)) when seeking to have a new house or business connected to the electricity distribution system, when calling to report a fault, or with queries regarding meter installation.

reason to contact the company with a query or a complaint. The quality of these transactions can be measured by the time taken for the company to respond.

Given the wide range of transactions between a company and a customer, the reality is that companies have substantial discretion over the services it provides and the way it provides them as well. Important factors in analysing how a company interacts with and responds to the needs of customers include the presence or absence of a complaints procedure, how the matter was handled and if it was settled satisfactorily as well as the information the company itself collects regarding customer service. One of the most direct ways that regulation works to ensure good customer service is through commercial quality standards or requirements. Table 1.1 indicates some of the transactions that are usually associated with commercial quality standards adopted in several countries. A complete list of existing standards in each country is given in Annex 1.

It is helpful, in general terms, to identify which standards relate to distribution functions and which relate to supply functions. As expected[2], the majority of commercial quality standards covered by the CEER survey (and applicable in practice) relate to distribution rather than supply functions, for example standards relating to the estimate of charges for connection, notice of supply interruption, restoring/reconnecting supply and voltage complaints. In countries where metering is not open to competition, for example in Ireland, Portugal and Spain the relevant commercial standards for metering fall on the DSO. On the other hand, in Great Britain for instance, it is the individual supplier who is responsible for providing the meter, meter disputes, pre-payment meters and meter changes and thus carries metering obligations. Again, depending on the country, commercial quality standards regarding appointments, disputes and payments may be unique to the DSO or common to both the DSO and the supplier.

2 The Conclusions of the CEER's first benchmarking report entitled "Quality of Electricity Supply: Initial benchmarking on Actual Levels, Standards and Regulatory Strategies, April 2001", anticipates (p. 41) the likely continuation of regulation of distribution-related quality parameters but possibly less regulatory intervention in supply related factors as electricity supply markets become more competitive.

TABLE 1.1 MAIN TRANSACTIONS BETWEEN COMPANIES AND CUSTOMERS

TRANSACTIONS BEFORE SUPPLY	TRANSACTIONS DURING CONTRACT VALIDITY	
	REGULAR TRANSACTIONS	OCCASIONAL TRANSACTIONS
• Connection (supply and meter)	• Accuracy of estimated bills	• Responding to failure of supplier's fuse
• Estimating charges*	• Actual meter readings	• Voltage complaints
• Execution of works*	• Service at customer centres	• Meter problems
	• Telephone service	• Queries on charges and payments
		• Appointment scheduling
		• Responding to customer's letters (information requests)
		• Responding to customer's claims
		• Reconnection following lack of payment
		• Estimating charges*
		• Execution of works*
		• Notice of supply interruption

* Applicable to both types of transactions

1.2 Commercial Quality Regulation

The Need for Commercial Quality Regulation

Several factors affect the services which consumers receive, not least of which is the evolution of the liberalisation process itself, a point which is dealt with in section 1.7 below. On the one hand it can be argued that the standard of commercial quality may suffer as companies who are subject to price cap regulation tighten their belts in an effort to cut operating expenditure. Some question whether, in the short term, liberalisation will lead to better service for "eligible customers" than for "non-eligible" customers as competition begins to influence decisions about customer service for companies who serve both sets of customers. On the other hand it can be argued that the standard of commercial quality will improve as (supply) companies begin to compete on services (as well as on price) in an attempt to win customers. This hypothesis is beyond the scope of this report. What is clear, however, is that most

countries have some form of commercial quality regulation. This may reflect a need to improve commercial quality at least until such time as all customers have free choice of their supplier. Customers, particularly those with little or no choice about supplier, should be able to expect a level of service that meets a minimum (and understood) standard.

Tools to Guarantee and Promote Commercial Quality

Commercial quality regulation attempts to ensure standards governing commercial quality. This is achieved, to different extents in each country, through the use of regulations or codes, performance standards, the dissemination of information to promote the quality of service as well as through strategies to encourage customer participation. The latter includes customer call centres or customer contact centres. The following diagram shows six aspects of quality of service regulation that have an important role in guaranteeing commercial quality.

Of the ten countries surveyed, all (except Finland and Norway) either have in place or are working on and implementing commercial quality regulation. In Finland commercial quality regulation is in most cases based on recommendations made by the Finnish Electricity Association. Where commercial quality regulation has developed, it has been established through a mix of licence conditions which contain some com-

mercial quality elements as well as through codes and regulation governing access, connection, supply and metering.

For example general conditions of energy supply contracts establish rights and duties which aim to guarantee adequate commercial quality. In Spain, Italy, Portugal and Great Britain, the general supply contract conditions are regulated and cover subjects like billing, metering and power control, payments, complaints and disputes resolution. In the Netherlands and Norway, the priority is to regulate contracts related to network access. In addition, in some countries such as Ireland and Great Britain, regulator approved Connection Agreements and Metering Codes exist and include provisions relating to commercial quality.

Seven countries have specifically tailored commercial standards (guaranteed or overall) which require operators to meet certain minimum levels of quality of service. The institution of the Guaranteed Standard (described below) is an effective means by which the regulatory framework can stimulate the continuous increase in the standards of supply. Furthermore, regulators in some countries have developed, either formally or informally (through their day to day dealings with customers), a means of collecting information by which they can assess the level of customer satisfaction. To examine the current state of play, CEER has conducted a benchmarking exercise of commercial quality.

1.3 Commercial Quality Questionnaire

In late 2002 the Working Group updated the information on Commercial Quality standards in the First Benchmarking Report, by obtaining comparable information from as many countries as possible. This was achieved by issuing questionnaires to the members of the Quality of Supply Working Group. This proved to be a most useful exercise in broadening the scope of the initial benchmarking study (where six countries participated) to covering a total of ten countries in the second benchmarking study.

Scope of the Questionnaire

The CEER Working Group designed a questionnaire to examine:

1 Actual levels of commercial quality;
2 Standards (guaranteed and overall) in commercial quality;
3 Criteria to calculate times for commercial quality services (homogeneity warnings);
4 The impact of liberalisation on commercial quality regulation.

Regulators were asked to complete sixteen questions on actual levels and further twenty-six questions on standards of commercial quality. One question regarding the actual average response time to restore supply after disconnection is excluded from the analysis as it was open to different interpretations. Another question regarding the standard for responding to customers is also excluded on similar grounds that the question was somewhat ambiguous. In addition, each country was requested to define in more detail the indicators of commercial quality in their country in order to aid the harmonisation of information received on actual levels. Information gathered on the actual levels and the standards which are in place can be found in Annex 1. Information was collected on the standards required from supply and distribution companies (rather than on the requirements of the regulator) and on the penalty payments in the event of non-performance of the required standards (where appropriate). A further approach that could be adopted is identifying the characteristics of commercial quality important to the customer. This survey did not research the consumer protection policies and procedures across countries. Neither did it examine the customer perspective of the characteristics of good service commercial quality or attempt to measure customer attitudes and satisfaction. Information about the impact of liberalisation process on commercial quality regulation was gathered and can also be found in Annex 1.

Data Availability

The analysis in this report is based on the information obtained from (all or some, as appropriate) the following (ten) countries: namely Austria (A), Finland (FIN), France (F), Great Britain (GB), Ireland (IRL), Italy (I), the Netherlands (NL), Norway (NOR), Portugal (P) and Spain (E).

1.4 Actual Levels of Commercial Quality

Benchmarking of the actual levels of commercial quality (in the year 2001) is limited for the following reasons:

- actual levels of commercial quality depend upon standards which differ from country to country;
- many countries[3] (Austria, Great Britain, Spain and Luxembourg) lack information about the actual levels of commercial quality in the year 2001;

3 Spain only introduced Commercial Quality Regulation in 2001. For the year 2001, Great Britain data is either not available or is not robust enough on a national level to be included in the survey.

- different data reporting methodologies. Some countries report data on the basis of percentage deviation from commercial standards in place (in their country) and not on the basis of averages which are independent of varying standards.

For the year 2001, cross country comparable data on actual levels of commercial quality can be found in Table 1 in Annex 1. The indicators with the largest number of comparable data on actual levels are shown in Table 1.2 below.

TABLE 1.2 MOST COMMON ACTUAL LEVELS OF COMMERCIAL QUALITY IN 2001

	France	Ireland	Italy	Portugal
No. of calls per 100 customers in call centres	100	154	n.a.	102.3
Average annual meter reading per customer	1.78	3.8	0.947 (%LV)	2.0 1.96 (%LV, P<41.4 kVA)
Percentage of Estimated Bills	0.13%	33.61%	n.a.	18.5%
No. of revised bills per 100 customers	0.8	2.3	0.45 (%LV)	3.17

n.a. = not available

France and Portugal indicate that the number of calls per 100 customers in call centres is in the region of 100 and 102.3 respectively compared to 154 for Ireland. The highest average annual meter read per customer is in Ireland (3.8). France has the lowest percentage of estimated bills (0.13%) compared to 33.61% in Ireland. With regard to the number of revised bills per 100 customers, the figures are best for Italy, but note this is on the percentage basis of LV customer (rather than all customers). From the information collected, it is difficult to make useful cross-country comparative analysis and to consequently draw reliable conclusions about actual levels of customer service quality across countries. What can be observed is that the reporting of data (and potentially the collection of data) on commercial quality differs substantially across countries. In conclusion, the most interesting result that can be drawn from the survey on actual levels of commercial quality is that different reporting methodologies are adopted across countries, rather than its value in making cross country comparisons.

1.5 Standard of Commercial Quality

Standards of performance are a regulatory tool common to many countries (seven) for establishing minimum customer service quality standards. Standards of commercial quality take two forms, guaranteed standards and overall standards.

- Guaranteed Standards, set minimum service levels, which must be met, in each individual case. If the company does not meet these standards, compensation at fixed rates is payable to the individuals concerned.
  The definition of guaranteed standards includes the following attributes:
  1) Service covered (e.g. estimating charges).
  2) Required performance level – usually with a response time (e.g. 5 working days).
  3) Penalty payment to be paid to a customer who fails to receive this level of service (e.g. 20).

- Overall Standards, cover areas of service where it may not be possible to give individual guarantees but where customers have a right to expect predetermined levels of service. With overall standards, the company is required to conduct its business in such a way as to be reasonably expected to deliver the standard.
  Overall standards are defined as follows:
  1) Service covered (e.g. connecting new customers' premises to electricity distribution system).
  2) Minimum performance level (usually a percentage) to be achieved over a defined period (e.g. 90% of cases should be connected within 20 working days, over a one year period).

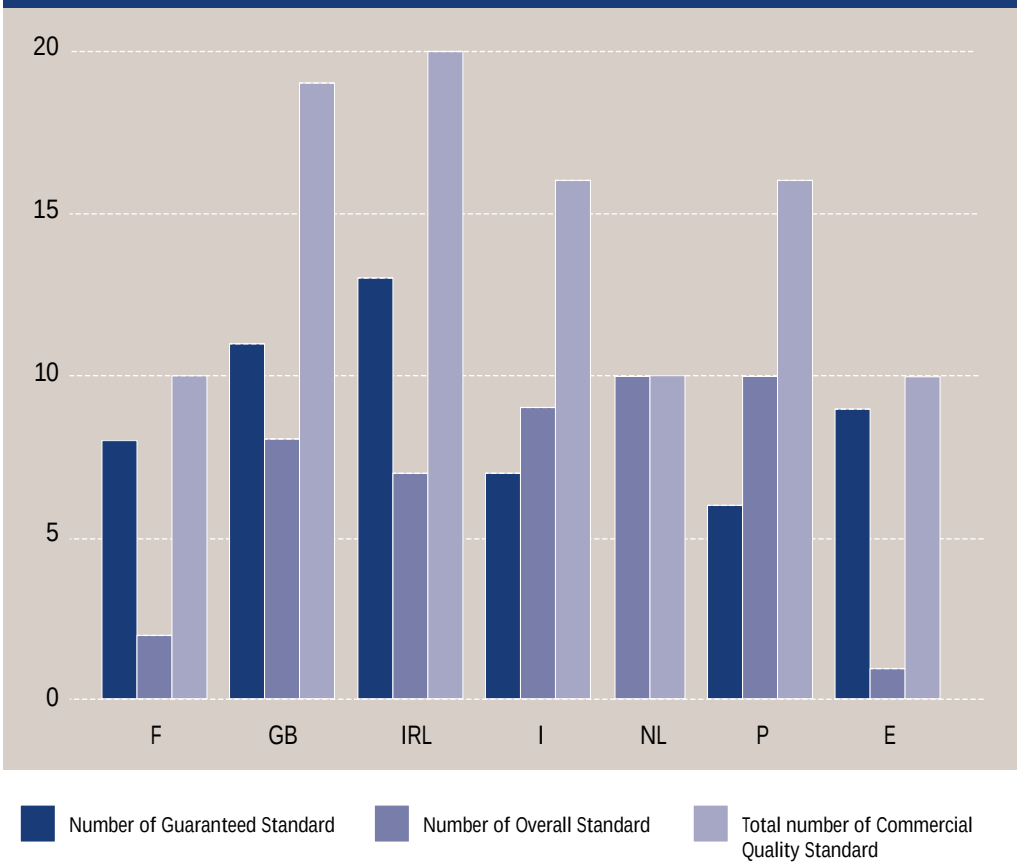
The Role of Standards and Reporting in Improving the Quality of Service

Overall standards do not carry penalty payments but are fundamental to monitoring and promoting quality of service. The institution of the guaranteed service is a very effective means for the regulatory system to stimulate the continuous increase of the standard of supply. However, both types of standards are only effective if the consumers get sufficient information about it. Regular (annual) reporting by the regulator of the performance of companies is an effective means not only to measure performance and for the company to improve its image, but also to inform customers of the standard of service they can expect. The presence of standards and regular reporting on quality actual levels also confirms the improvement of the standard of customer service as a regulatory objective in several countries.

Number of Overall and Guaranteed standards

The information collected through the questionnaire on twenty five different Standards of Commercial Quality, is summarized in the following sections. Of the ten countries surveyed, standards are in place in seven countries namely France (F), Great Britain (GB), Ireland (IRL), Italy (I), the Netherlands (NL), Portugal (P) and Spain (E). The survey results of the Commercial Standards in each country are reported in Table 2 in Annex 1. As previously stated, Austria currently does not have any commercial quality regulation, so no standards exist. In the case of Norway, commercial quality requirements are established through the distribution companies' licences which describe the obligations in general terms rather than formulated in specific commercial standards as described above.

FIG. 1.1 COMMERCIAL QUALITY STANDARDS OVERVIEW



Of the twenty-five standards covered by the questionnaire, the survey shows the countries with the most standards in place are Ireland (20), Great Britain (19), Portugal (16) and Italy (16). Ireland, with the most standards, has thirteen guaranteed and seven overall standards. In France, Great Britain, Ireland and Spain, Guaranteed standards are more widely used than Overall Standards while in Italy and Portugal

the opposite is true. All commercial standards in place in the The netherlands are Overall Standards.

In five of the seven countries which have performance standards, two of the transactions before supply (namely connection and estimating charges for simple works) listed in Table 1.1 carry a guaranteed standard and thus obliges the company to make a financial penalty payment if it fails to meet the standard. The handling of regular transactions (e.g. customer call centres) is at the discretion of the companies and tends not to carry guaranteed performance standards. The number and service areas covered by guaranteed standards and overall standards differ from country to country.

Limitations to Comparative Analysis of Commercial Standards

In an individual country, a company's performance can be measured against the target set by the commercial quality standard in place. Even then, differences in targets set for different (supply) companies make it difficult to summarize performance against the overall standards. Cross country comparisons about commercial quality performance levels are even more difficult for a number of reasons including:

- Lack of information about actual levels of commercial quality (only partially available as evidenced in Table 1, Annex 1).
- Operating environments are not homogeneous and performance (on the standard for restoring supply) can be affected by factors such as geography and climate.
- Different legal and regulatory frameworks.
- Different market organisations – numbers and types of companies.
- Different degrees of market liberalisation.
- Current standards are based largely on historical factors (e.g. current standards in Italy were defined to substitute for standards established in the revoked "Carte dei Servizi". In this kind of situation the setting of new performance levels is often dependent on previous practice and performance).
- The definition of standards is not exactly the same country by country (see Annex 1).
- The rules of procedure applying to standards differ across countries (for example whether the penalty is automatic or must be claimed by customers).

Although standards are not always directly comparable, the survey results show that several commercial standards are commonly applied and can be used for comparative purposes. However, caution should be exercised in drawing definitive conclusions from the comparative information presented below. This is because the rules of procedure of guaranteed services not only describe the detailed specification of the elements of the guaranteed service but also how to make a claim for compensation, the amount and deadline of compensation as well as the exemptions from making the

penalty payment. Information obtained from the questionnaire is limited to the type of standard (Guaranteed or Overall), the performance level required, the penalty payment applicable (as appropriate). Analysis of the information in Annex 1 is presented below.

Penalty Payments

Guaranteed standards are always linked to penalty payments. Penalty payments have the following main functions:

- To give customers some compensation when companies fail to provide the level of service required (guaranteed standards).
- To give customers an indication that commitments to quality of service are effective.
- To penalise poor performance by companies and give incentives to improve quality of service.

The payment of penalties can either be automatic or subject to customers' claims. At present, for all countries which have guaranteed standards for commercial quality (France, Ireland[4], Italy, Spain, Portugal[5] and for some standards in Great Britain), the payment is automatic. For the other standards in Great Britain, the customer must make a claim for the payment if the standard is not met. In the The netherlands, penalty payments for commercial quality standards are not yet defined.

TABLE 1.3 PENALTY PAYMENTS

AUTOMATIC	France, Ireland, Italy, Spain, Great Britain* and (now also) Portugal
CLAIMED	Great Britain*

* means some standards in GB must be claimed

Both the levels of guaranteed service and the associated penalty payments for eight individual standards are detailed in section 1.6 below. More generally however, Ireland (in addition to having the highest number of standards which carry penalty pay-

4 The one exception in Ireland is the network repair guarantee which must be claimed within one month of the supply failure.

5 Previously, in accordance with the Quality of Service Code (in force since 1st January 2001 to 5th February 2003) the penalty payments in Portugal had to be claimed by the customers. In accordance with the new Quality of Service Code, in force since 6th February 2003, the penalty payments related to commercial guaranteed standards are automatic since March 2003. Penalty payments related to continuity of supply guaranteed standards will be automatic from 2004 onwards.

ments (13)), consistently pays the highest penalties in the event of non-performance, with a typical payment of 35 to domestic customers. The exception is for the number of meter readings in a year, where Spain is the only country with a guaranteed standard. In contrast, the payments in Portugal for non-compliance with the guaranteed standard are relatively poor at 15 to domestic (LV) customers. For further details country by country see Table 2 in Annex 1.

1.6 Benchmarking of Commercial Quality Standards

Table 1.4 shows the eight most common standards which are used in at least five countries. The full list can be found in Table 3 in Annex 1.
The scope of the standards for services differs widely across countries, both in terms of the type of standard (overall or guaranteed), the required performance level and the associated penalty payment (if one exists).

Assumptions for Comparative Purposes

Then following graphs show the actual service level and penalty payments attaching to the eight individual services in table 1.4 above across seven countries. In some countries (e.g. Spain), different performance levels are defined for some standards depending on customer size or complexity of services (see Annex 1). The penalties also differ in some countries (e.g. Portugal and Italy) depending on the type of customer or voltage level. Figures in this section (from fig 1.2 to fig 1.9) show the required performance levels of standards (guaranteed and overall) for domestic (LV) customers. Where applicable, payments for business (non-domestic) customers tend to be even higher.

For five of the eight services, the performance level is observed in terms of working days to deliver the service. The lower the number of working days to deliver the service, the higher the standard required from the company. For comparative purposes,

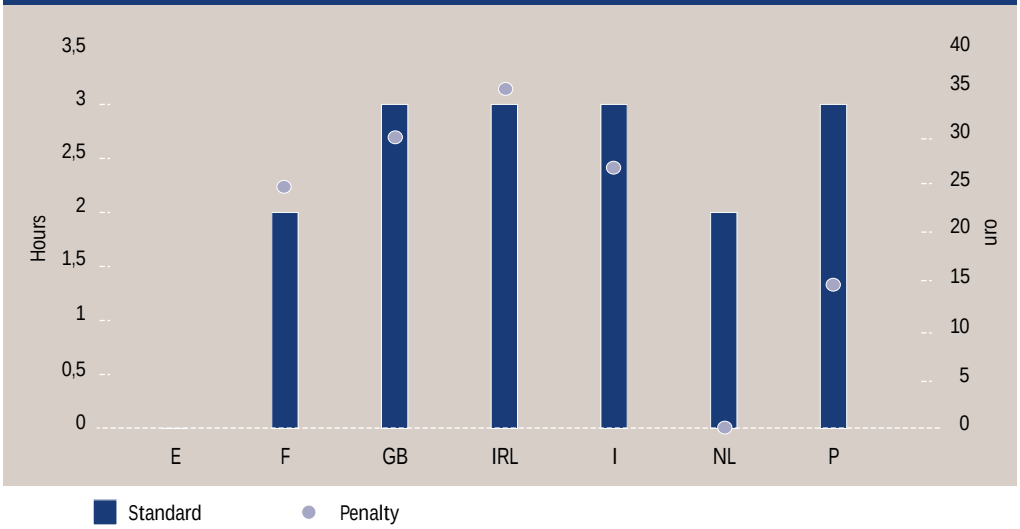
- payments are reported in euros;
- where the standard is an overall standard (which does not carry a penalty payment) the penalty is shown as zero;
- where standards are specified in calendar days, these have been converted into equivalent working days.

TABLE 1.4 MOST COMMON GUARANTEED AND OVERALL STANDARDS

SERVICE	GS/ OS	FRANCE	GREAT BRITAIN	IRELAND	ITALY	THE NETHERLANDS	PORTUGAL	SPAIN	N.
		Standard	Standard	Standard	Standard	Standard	Standard	Standard	
Connection (supply and meter)	GS								5
	OS								2
Estimating Charges for Simple Works	GS								5
	OS								1
Meter problems	GS								4
	OS								2
Queries on charges and payments	GS								4
	OS								2
Appointments scheduling	GS								5
	OS								1
Number of meter readings within a year	GS								1
	OS								5
Response to customers letters	GS								1
	OS								5
Response to customer claims	GS								3
	OS								4
Execution of simple works	GS								3
	OS								2
N. Total	GS	6	5	6	4	0	3	7	
	OS	1	3	3	5	6	6	0	

= where Guaranteed Standard (GS) is in place; = where Overall Standard (OS) is in place

FIG. 1.2 STANDARDS AND PENALTIES FOR APPOINTMENTS SCHEDULING



Appointments Scheduling

Four Countries (GB, IRL, I and P) have the same performance standard of 3 hours, but penalty payments differ significantly. Ireland has the highest payment of 35 in the event that the company fails to meet the required standard. In Great Britain and Ireland, the standard is a morning or afternoon appointment which has been converted into a 3 hour equivalent.

Connection (supply and meter)

France, Great Britain and Portugal all have a guaranteed standard of two working days. Italy and Spain have relatively low performance levels of five working days for connections. Ireland guarantees 3 working day for connection and has the best com-

FIG. 1.3 STANDARDS AND PENALTIES FOR CONNECTION (SUPPLY AND METER)

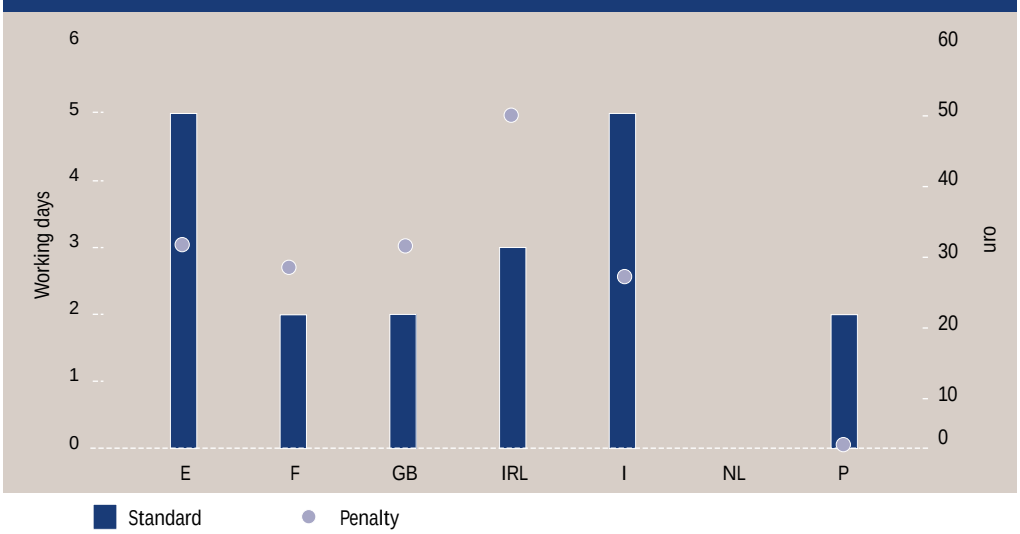
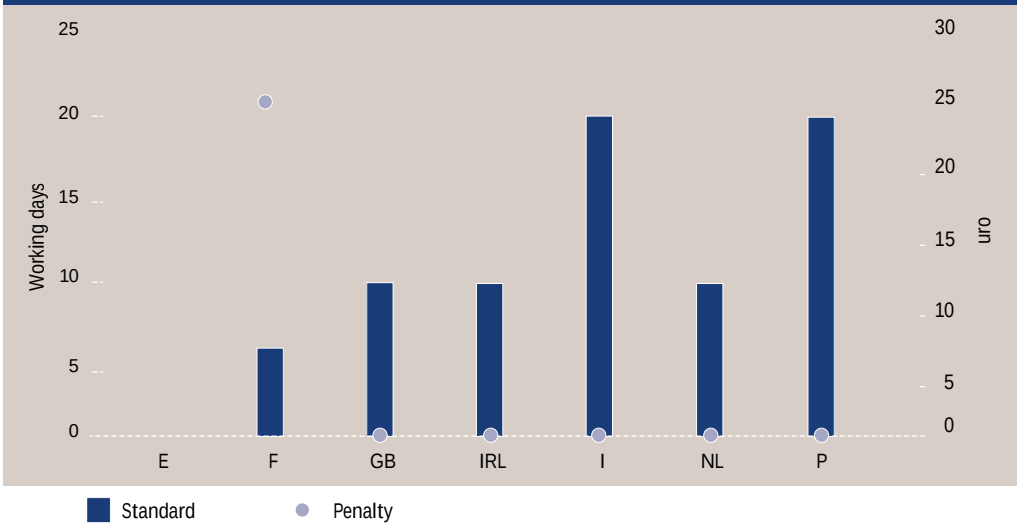


FIG. 1.4 STANDARDS AND PENALTIES FOR RESPONSE TO CUSTOMERS' LETTERS



pensation value of 50. In general, for connections (supply and metering) the payment is relatively uniform but the performance level differs across countries.

Response to Customers' Letters

France has the highest standards in terms of performance level (8 days or an equivalent of 6 working days) and is the only country with a specific guaranteed standard for response to customer's letters. Of the others, Spain does not have any commercial standard while Great Britain, Ireland and the Netherlands all have the same overall standard of 10 working days. Portugal and Italy have comparatively low standards of 20 working days to respond to letters.

FIG. 1.5 STANDARDS AND PENALTIES RESPONSE TO CUSTOMERS' CLAIMS

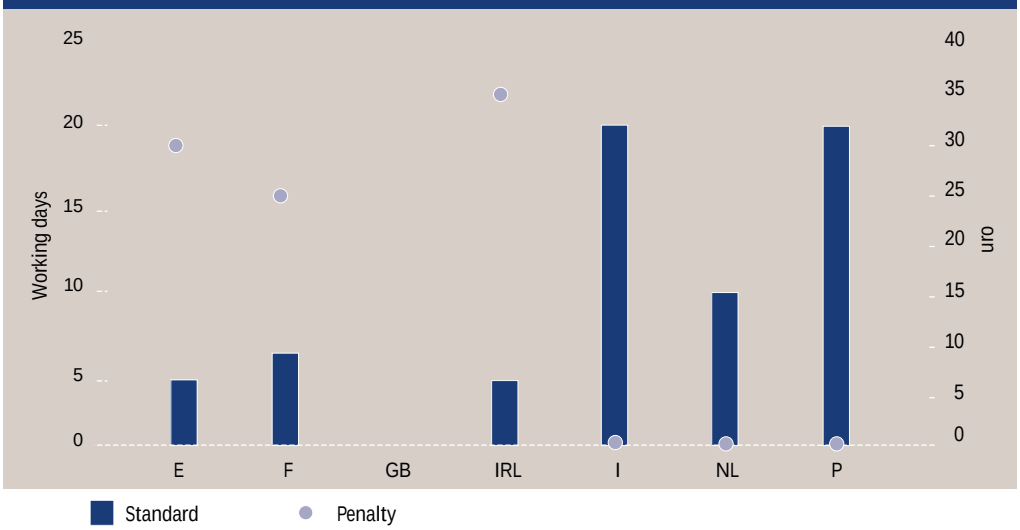
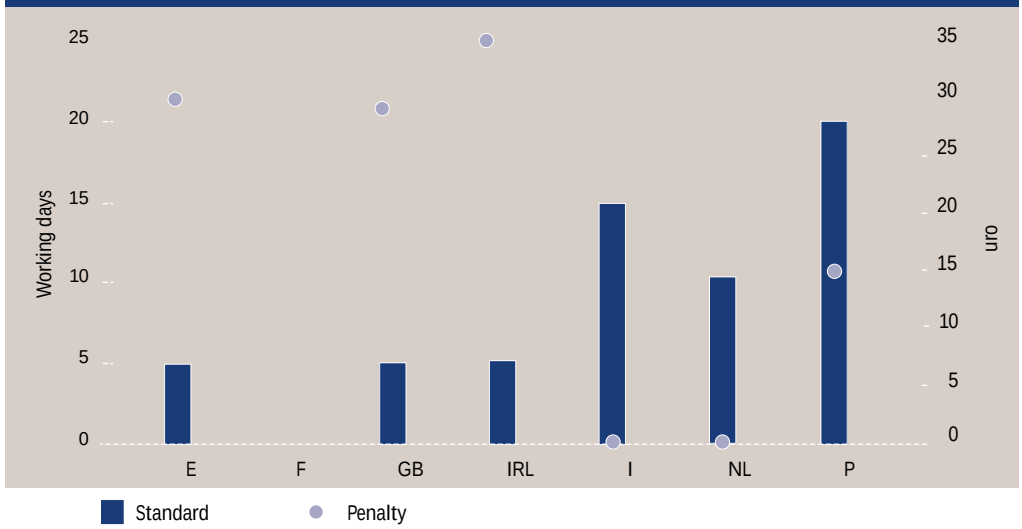


FIG. 1.6 STANDARDS AND PENALTIES FOR QUERIES ON CHARGES AND PAYMENTS



Response to Customers' Claims

Only three countries (Spain, France and Ireland) have guaranteed standards for responding to customer claims. Ireland sets the highest standard in penalty (35) and performance level (5 working days). Both Italy and Portugal set low overall performance targets of 20 working days.

Queries on Charges and Payments

Spain, Ireland and Great Britain each set the same performance target of 5 working days for queries on charges and payments. Ireland sets the highest penalty payment. France does not have any standard. Of the four countries with guaranteed standards, Portugal has the lowest performance target (20 days) and the lowest penalty payment (15).

FIG. 1.7 STANDARDS AND PENALTIES FOR NUMBER OF METER READINGS PER YEAR

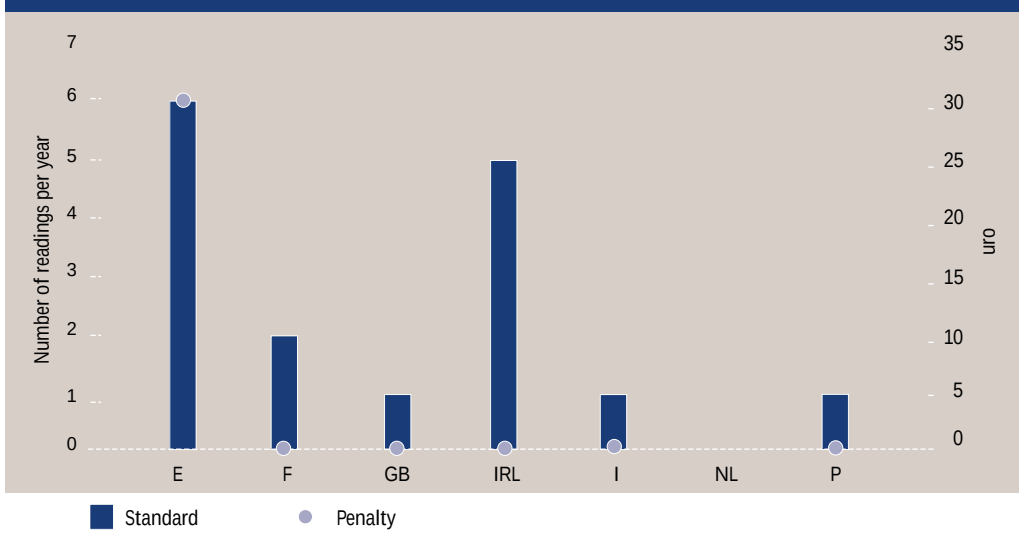
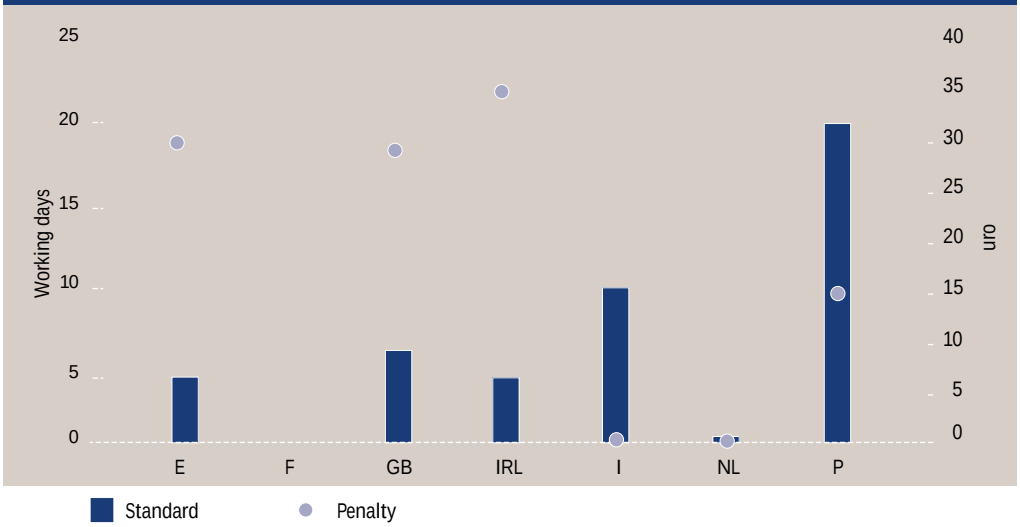


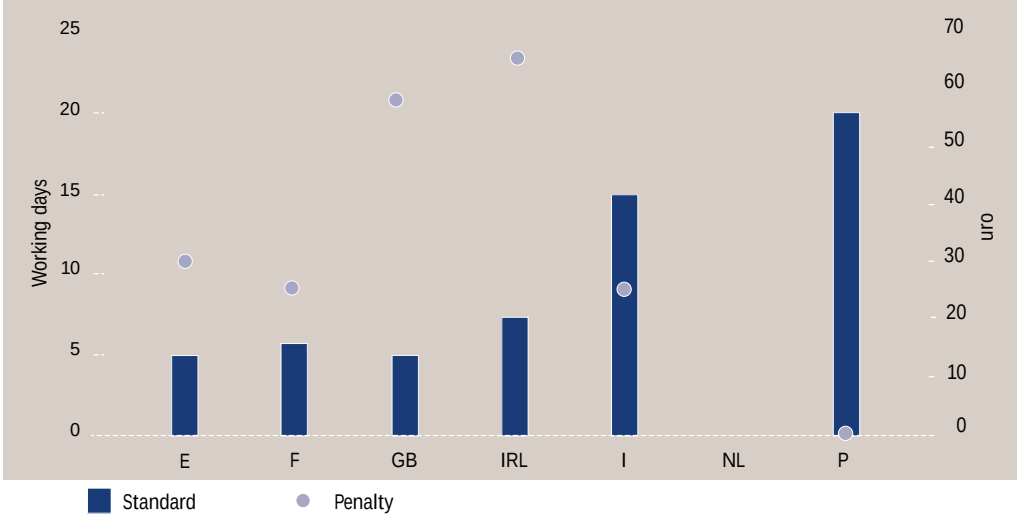
FIG. 1.8 STANDARDS AND PENALTIES FOR METER PROBLEMS (VISITS)



Number of Meter Readings per Year

In this instance a high value of the left hand axis of the chart corresponds to a higher performance target for the number of meter reads. Spain has the highest standard with a minimum of 6 meter readings[6] guaranteed in a year and a compensation of 30 (or 10% of the first bill) in the event of failure to meet the target. The Netherlands does not have any standard for the number of meter readings and the other five countries have overall standards ranging from 1 to 2 readings per year.

FIG. 1.9 STANDARDS AND PENALTIES FOR ESTIMATING CHARGES FOR SIMPLE WORKS



6 There are some exceptions e.g. the over all standard for holiday nomes is two weter readings.

Meter Problems (Visits)

In case of responding to meter problems, the most demanding standard for a visit is in the Netherlands (2 hours) and the least demanding standard is in Portugal (20 working days). For the relevant time period (year 2001), the standard in the Netherlands was an overall standard. Ireland had a high performance standard (5 working days) and the highest penalty payments (35).

Estimating Charges for Simple Works

Between 5 and 7 working days is standard for estimate charges for simple works across four countries. Portugal has the least demanding performance levels (20 working days) and no penalty payment. Italy lies in the mid range in terms of performance level (15 working days) and payment (25.82).

Summary of Benchmarking of Standards of Commercial Quality

While standards of performance are widely applied across the seven countries, significant differences are observed with regard to the number of (guaranteed and overall) standards, the required performance levels and the imposed penalty payment.

- The number and services covered by Guaranteed Standards, as opposed to Overall standards, differ from country to country.
- The performance levels required for a given service differs across countries. For example, in Portugal, the guaranteed standard for estimating charges for simple works is within 20 days compared to within 5 days in Great Britain and Spain. The likely result is significant differences in the services offered across countries, however it was difficult to test this hypothesis due to the lack of available information on actual levels of commercial quality outlined above in section 1.4.
- Penalty payments to customers for non-compliance with guaranteed standards also differ significantly. In most countries the compensation for failure to meet the standard is automatic, whereas in Portugal and France (and for some standards in Great Britain), the customer must make a claim for the compensation. Further more, Great Britain and Ireland offer more standards in general, more guaranteed than overall standards and the payments are more favourable than in other countries.
- For the eight most common standards Ireland, and to a lesser extent Great Britain, has consistently more demanding levels and higher payments than the other countries. Portugal has less demanding performance levels for these standards and while the Netherlands has comparable performance targets to other countries, all of its standards are overall standards.

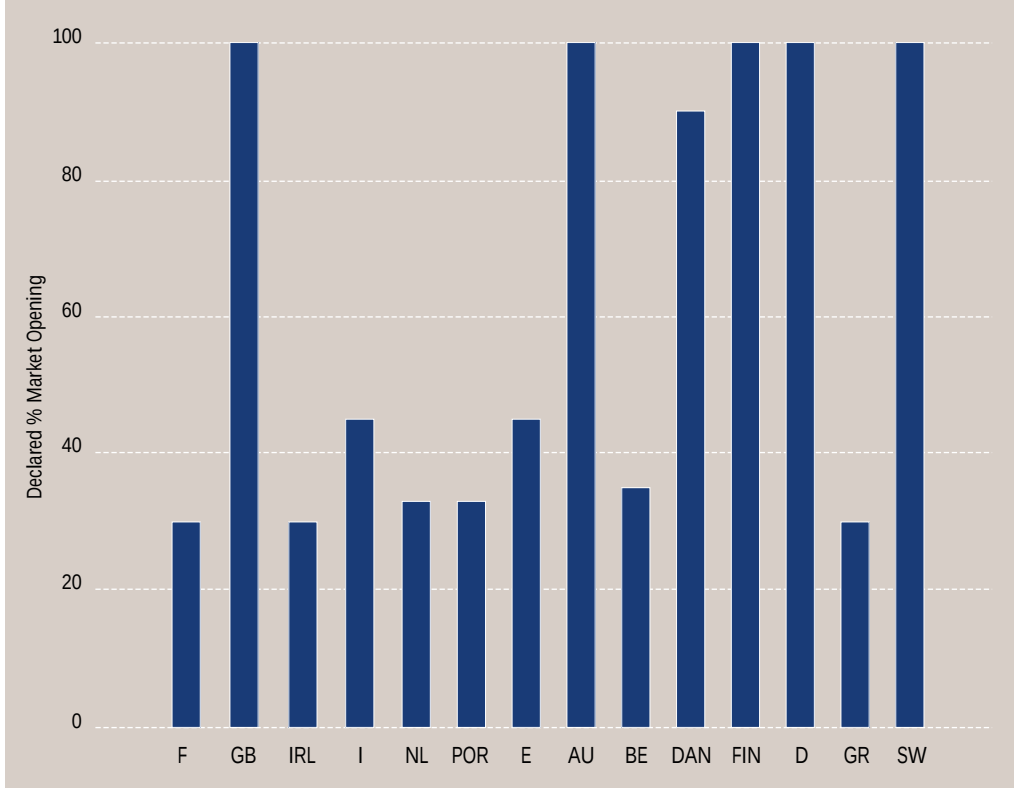
1.7 Effects of Liberalization

In an effort to extend the scope of the first benchmarking report to examine the impact of liberalisation on commercial quality regulation, the questionnaire included six questions on the impact of liberalisation, the answers to which can be found in Table 4, Annex 1. It shows the relative importance of the promotion of good customer service (commercial quality) across countries. Eventhough regulatory practices and frameworks differ across countries, almost all have some form of commercial quality regulation, albeit implicit in Codes or Regulations which contain some commercial quality elements. The exceptions are Austria and Finland where, to date, there is no commercial quality regulation.

Degree of Electricity Market Opening

European countries are at different stages of electricity market liberalisation. The differing degree of market liberalisation across countries (in Year 2001) is set out in Figure 1.10 below.

FIG. 1.10 OPENING UP OF THE ELECTRICITY MARKET



Source: European Commission – First Benchmarking Report on Implementation of the Internal Electricity and Gas Market, SEC (2001) 1957 of 03/12/2001.

The Figure shows that the degree of market opening differs across countries in the year 2001[7]. Furthermore, the CEER survey shows that countries appear to be at different stages in terms of the development of commercial quality regulation. Most interesting from Figure 1.10 above (which shows the degree of market opening) is that the first seven countries shown on the chart have in place commercial quality standards whereas the latter eight countries do not. Four of these eight countries have full market opening. Two countries (Ireland and Portugal) that reported actual data for a considerable number of commercial standard indicators in Annex 1 (and incidentally who also ranked high in terms of the number of standards which were surveyed), had only approximately 30% market opening in 2001. Great Britain is fully opened and also had the second highest number of commercial standards (of the twenty-five standards covered in CEER's commercial quality survey). In contrast, Austria and the Nordic countries have full competition but without any commercial quality regulation. A possible part of the explanation of differences is how long the regulatory authority has been established, the average level of commercial quality and the perceived quality from customers.

Will Commercial Quality Diminish as Competition Evolves?

It is widely accepted that the need for prescriptive regulation diminishes as competition evolves. Thus one might expect countries to follow a cycle of initially putting in place commercial quality regulation as markets are initially liberalised. Overtime, as competition develops, the relevance and need for such standards should be reviewed in the context of whether competition is sufficiently developed so as to be relied upon in the absence of commercial standards. This is true of standards pertaining to supply functions only (and potentially to metering).

Importantly, however, commercial quality relates mainly to distribution (which is a natural monopoly) and to metering issues, rather than to supply. The implication is that the number of commercial quality standards is unlikely to diminish as competition evolves. Moreover, market liberalisation is likely to change the framework with the fine-tuning of regulation. A case in hand is Great Britain, wherein recently the regulator (Ofgem), reviewed the future application of standards of performance in electricity and gas, with a view to potentially discontinuing or amending certain supply and metering standards. In finding that real competition is in place, it removed only two standards and indeed introduced two new ones (on switching) leaving the total number of commercial standards unchanged.

7 The current position (where it differs from the table) is as follows; Belgium (52%), Denmark (100%), France (37%), Greece (34%), Ireland (56%), Italy (70%), Luxembourg (57%), the Netherlands (63%), Portugal (45%), Spain (100%): Source: European Commission Second Benchmarking Report, SEC (2003) 448.

Qualitative Information on Impact of Liberalisation

Responses from the six questions on the impact of liberalisation are summarised as follows. Full responses are in Table 4, in Annex 1.

Has the regulator changed commercial quality regulation (especially in respect of supply liberalization or separation between Distribution and Supply)?

- In Portugal and Spain, commercial quality regulation is the responsibility of the General Director of Energy and the Ministry of Economy respectively rather than the regulator.
- In Finland, the regulator has very little to do with commercial quality regulations which are in most cases only recommendations made by the Finnish Electricity Association.
- In Austria and France there is no commercial regulation yet. The only rules in France are based either on contractual relations or good behaviour principles.
- In all other countries (including the Netherlands, Ireland, Italy and Great Britain) significant changes were introduced, with codes, licences and agreements which contain some commercial quality elements.
- In Spain, Portugal commercial quality standards have been place on distribution companies only and suppliers do not have to comply with any commercial quality standards.
- Commercial quality standards in Great Britain and Italy have been split into two groups to reflect the distinction between distribution and supply. In Italy, the supplier is allowed to change supply standards for eligible customers only, if they subscribe to a specific contract.
- Great Britain, which arguably has the most sophisticated commercial standard regulation in place, recently reviewed the future application of standards of performance in electricity and gas, with a view to potentially discontinuing or amending certain supply and metering standards.

Standards imposed on Distributors and Standards imposed on Suppliers

- In the Netherlands, separate standards are imposed on the distributor for eligible and captive customers.
- In Ireland a DSO Charter is in place for 12 different guaranteed services relating to the network including guarantees for connection quotations, planned supply interruption and network repair.
- In Portugal, there is not a legal distinction between supplier and distributor. All standards, six of which are guaranteed, are imposed on the distribution companies for supply and wires businesses.
- In Italy, there are supply standards relating to reading, response time to customer

queries and minimum number of bills on actual readings exceeding estimation. In addition, standards on written queries and claims apply to each supplier. All the supply standards are overall standards.

- In Great Britain, nine standards apply to distribution companies, and eight apply to supply companies. The supply standards in the main relate to metering.

How is metering regulation defined in respect of commercial quality aspects?

- In Great Britain, Ireland, the Netherlands, Norway, and Portugal metering provisions are set out in Metering Codes[8]/Agreements.
- In Ireland, Great Britain and Portugal commercial standards exist for metering activities.
- Specific commercial quality regulation regarding metering does not currently exist in Italy or Spain. In Italy metering standards are included in distribution standards.
- In Austria, metering is covered by Distribution company's general terms and conditions.
- In Austria, Ireland, Italy, France, Spain, Norway and Portugal metering is not opened to competition and is the responsibility of the Distribution company.
- In the Netherlands, Finland and Great Britain metering is a free market.
- In Finland some metering regulations are defined in the Electricity Market Decree.

Is there any regulation for switching supplier? Is there some standard about switching?

- In Norway, the Netherlands, Austria, Ireland, Portugal, and Great Britain, there is a process for switching supplier. Currently (2003), there is a proposal in Spain for switching supplier whereby the customer will pay the costs incurred.
- In Finland, according to a draft law it will be possible for customers to switch supplier once a year without cost.
- In Italy and France, there is no regulation for switching yet.

Is the supplier the only customer interface or can eligible customers have direct relations with the distribution network operator (for instance for connections)?

- In Norway, Ireland, Austria, Finland, Portugal, Great Britain the customer has direct contact with the network operators in all cases concerning network issues (and metering as appropriate)

8 As of March 2003, the Metering Code in Ireland was subject to public consultation.

- In Spain, Italy and the Netherlands the customer can chose to have the supplier as the only customer interface. In the Netherlands the “supplier model is the preferred option to customers, but some use the “Networks model”.
- In France, the supplier can be the only customer interface if the customer has only one supplier.
- In many countries (for example Norway, Ireland, Portugal and Great Britain) Connection Agreements are in place. In Ireland, however the customer is required to have a supplier before the connection agreement is enforced.

Is the billing unique to the eligible customers or do they receive separate bills for distribution and supply?

- In Austria, the Netherlands, Portugal, Spain, the eligible customer can chose whether or not to have separate bills for distribution and supply.
- In Austria, customer who have not switched supplier away from the incumbent get only one bill, but the distribution and supply costs have to be listed separately on the bill.
- In Norway it is the network owner, rather than the customer, who decides whether they would like to open up for joint invoicing with a supplier or not. If the network owner decides to do joint invoicing with one supplier, the invoice shall identify the network operator and the seller of electrical energy.
- In France, eligible customers receive separate bills.
- In Finland, there is one bill but distribution and supply costs have to be listed separately on the bill.
- In Ireland and Great Britain, the customer receives a single bill and costs are not separated out. In Ireland, suppliers vary the representation of the various charges.

2 CONTINUITY OF SUPPLY

2.1 What is Continuity of Supply?

Continuity of supply is characterized by the number and duration of supply interruptions. It is widely accepted that it is neither technically nor economically feasible for a power system to ensure that electricity is continuously available on demand. Instead, the basic function of a power system is to supply power that satisfies the system load and energy requirement economically and also at acceptable levels of continuity and quality. "Quality of supply" is usually measured in terms of acceptable values of voltage and frequency, while "continuity of supply" refers to uninterrupted electricity service[9]. Reliability refers to the ability of a power system to provide an adequate[10] and secure supply of electrical energy at any point in time[11]. Supply interruptions regardless of their cause, mean a reduction in reliability.

The four main features of continuity of supply can be summarised as follows:

- The type of interruption: planned or unplanned interruptions. Planned interruptions are scheduled, for instance, to carry out necessary maintenance of the network. Planned interruptions which are not notified to customers should be recorded as unplanned interruptions.
- The duration of each interruption: short or long interruptions. In accordance with European technical standard EN 50160, interruptions that last more than 3 minutes are defined as "long interruptions", and others as "short interruptions".
- The voltage levels of faults and other causes of interruptions: The interruption of supply to final customers can originate at any voltage level, low/medium/high voltage, in the system. At high voltage and extra high voltage levels, not all faults cause interruptions to final customers, because of the network design.
- The type of continuity indicators: number or duration of outages. The number of outages per customer in a year, termed customer interruptions (CI) or System Average Interruption Frequency Index (SAIFI), indicates *how many times* in a year, energy is not supplied. The cumulative yearly duration of interruptions per

9 Billinton, R. and Allan, R.N., "Reliability evaluation of power systems" (Plenum Press, 1984)

10 Adequacy is the ability of a power system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system facilities (definition from NARUC, the US National Association of Regulatory Utility Commissioners). Adequacy problems are not addressed in this report.

11 Billinton, R. and Allan, R.N., "Reliability Assessment of large power systems" (Kluwer Press, 1988)

customer, generally referred to as Customer Minutes Lost (CML) or System Average Interruption Duration Index (SAIDI), indicates *how long* in a given year, energy is not supplied[12] (average per customer). These indices (of frequency and duration) provide useful information to regulatory authorities on the performance of the network in terms of security and availability respectively.

2.2 Main Conclusions on Continuity of Supply Regulation Drawn from the CEER's First Benchmarking Report

The main features of continuity of supply regulation and the prevailing practice (across the six countries surveyed) are described in the CEER's First Benchmarking report (April 2001), hereafter referred to as the "First Report". It addresses not only the measurement tools and continuity of supply standards but also the approaches adopted by regulators in guaranteeing and promoting continuity and the effects of liberalization on continuity of supply regulation. It is useful to highlight the relevant main conclusions of the First Report on continuity of supply regulation.

In brief, the First Report identified the two main features of continuity of supply regulation as (1) guaranteeing that each user can be provided with at least a minimum level of quality and (2) promoting quality improvement across the system. It further describes two main approaches. The first is the "quality of supply approach" which focuses on the individual level of continuity for each user by setting standards to avoid continuity falling below a minimum threshold and the second is the "quality of system" approach which focuses on overall continuity through the measurement of performance. It concluded that regulators generally combined the two approaches. It further showed that continuity of supply standards differ significantly across countries depending on the objective of the regulator.

The comparative analysis of available measurement and continuity of supply regulation in the First Report shows that regulators have generally approached continuity issues starting from long interruptions affecting LV customers, treating planned and unplanned interruptions separately. In several countries both the number and the du-

12 Energy not supplied (ENS) is linked to CML and is a more sophisticated indicator because it takes into account the disconnected power.

ration of outages are available for each indicator, but the choice of the indicator used varies by country and in many countries short interruptions (and sometimes, transient ones) are or will be recorded as well.

Different approaches to continuity of supply regulation, and in particular the different continuity indicators and standards adopted and recording methodologies used, combined with differing geographical, meteorological and network characteristics, makes benchmarking of actual levels of continuity of supply difficult.

2.3 Continuity of Supply Questionnaire

CEER's initial benchmarking of actual levels of continuity of electricity supply in the First Benchmarking report was limited to six countries. The focus of the Continuity of Supply chapter in this, the second CEER report, is to build on this work by updating and extending (both in scope and also in terms of the number of countries) the CEER's initial benchmarking exercise. To this end, the CEER issued a questionnaire on the Actual levels of Continuity of Supply to the members of the Quality of Supply Working Group in late 2002.

Continuity Indicators Used

The continuity indicators which form the basis of the continuity analysis in this report are "Customer Minutes Lost per year" (CMLs) and "Number of Interruptions per customer per year". The former measures the average frequency of the outage of a power system. The latter measures the average frequency of the outage of the power system. These two performance indicators are typically reported annually and in most countries and are split into planned (scheduled) and unplanned (unscheduled) interruptions.

Scope of the Questionnaire

The Continuity questionnaire is divided into four parts:

- Unplanned Interruptions: trend analysis; voltage level analysis, responsibility analysis; density analysis.
- Unplanned Interruptions: Regional Analysis
- Planned Interruptions: trend analysis
- Homogeneity Warnings (conditions of recording interruptions and measuring continuity)

For Unplanned Interruptions and Planned interruptions, regulators were asked to complete:

- Time-series data for the years 1999 – 2001 (aggregate nation-wide).

Year 2001 nation-wide data was also requested on the following basis:

- an Act of God/3rd party damages/utility responsibility split
- an urban/semi-urban/rural split
- Generation, Transmission & HV network, Distribution and MV network, Distribution and LV network split

The objective of collecting the data in this way is to facilitate a responsibility analysis, a density level analysis and a voltage level analysis.
For the Regional Analysis, regulators were asked to submit regional data on CML, number of interruptions per customer, distributed energy, length of MV circuits, number of users and area.

Data Availability

The analysis in this Chapter is based on the information obtained from the following (nine) countries: Finland (FIN), France (F), Great Britain (GB), Ireland (IRL), Italy (I), the Netherlands (NL), Norway (NOR), Portugal (P) and Spain (E).

TABLE 2.1 AVAILABLE DATA COUNTRY BY COUNTRY

	UNPLANNED INTERRUPTIONS				PLANNED INTERRUPTIONS
	DATA FOR TREND ANALYSIS	DATA FOR DENSITY ANALYSIS	DATA FOR RESPONSIBILITY & VOLTAGE ANALYSIS	DATA FOR REGIONAL ANALYSIS	DATA FOR TREND ANALYSIS
Finland					
France				n.a.	
Great Britain		n.a.			
Ireland					
Italy					
The Netherlands		n.a.		n.a.	n.a.
Norway		n.a.			
Portugal					
Spain		n.a.			

= available = partial n.a. = not available

2.4 Assumptions for Benchmarking of Actual Levels of continuity of supply

Because of different measurement practices in EU countries, available data on actual levels of continuity of supply are not always comparable. It is important to consider the country specific conditions detailed in Table 1 and Table 2 in Annex 2. In particular, the following should be noted:

- First, the scope of benchmarking of interruptions is limited to "long" interruptions, generally defined as outages longer than 3 minutes. However, the Netherlands does not differentiate between the length of interruptions (nor does it have available data for planned outages).
- Second, there are different ways to measure supply interruptions. Firstly, continuity data may be collected at all voltage levels or may exclude some voltage levels (LV voltage level or transmission interruptions). For instance In Norway, only interruptions originating in networks above 1kV are monitored; therefore, interruptions originating at LV level are not recorded. Secondly, continuity indicators may be referred to all the customers, or separately to LV customers and MV customers (the latter of course are not affected by interruptions originating at LV). For instance, in Portugal the continuity of supply on distribution activity is characterised considering separately the MV and LV customers, however the data available in this report are related to LV customers only.
- Third, regarding the data sets for aggregate nation-wide data, 80-90% of the MV network length is included in Finland. In Italy and Portugal the nation-wide data reported covers 99% of customers, in Great Britain and France it is confined to the mainland only. Great Britain is Scotland, England and Wales. This still encompasses a number of Island e.g. Shetlands, Orkneys, Isle of Wight that technically are not the mainland.

Finally, and perhaps most important, continuity indicators are not always defined in a comparable way. Continuity indicators can be weighted by three different methods; customer, transformer or power. This can give rise to differences depending on which weighting method is used. In very general terms, continuity indicators weighted by power affected provide better comparative data than continuity indicators weighted by numbers of customers, because large customers are likely to have fewer and shorter interruptions than small customers[13].

13 In Italy, it has been possible to compare the two series of indicators (weighted on customers and weighted on power) for the years 1996-1999. The comparison shows that measuring continuity with indicators weighted on power produces figures at least 20% smaller than the figures provided by the continuity indicators weighted on number of customers, other things being equal.

TABLE 2.2	WEIGHTING METHODS USED FOR CONTINUITY INDICATORS
USER	France, Great Britain, Ireland, Italy, the Netherlands and Portugal*
TRANSFORMER	Finland** and Norway
POWER	Spain

* In Portugal MV continuity of supply is characterized based on three indicators: SAIFI, SAIDI and TIEPI. SAIFI and SAIDI are indicators weighted by the number of customers, TIEPI is weighted by power.

** In Finland the indicator is based on transformer district and is not weighted in any way.

All references to CMLs in the following sections refer to the yearly average duration of supply (voltage) interruption per one customer. Similarly all references to the Number of Interruptions refer to the yearly average number of supply (voltage) interruptions per one customer (number/customer/yearly).

2.5 Survey Results of Benchmarking of Continuity of Supply

The following sections on the results of the benchmarking study on actual levels of continuity of supply structured as follows. First an analysis of the Unplanned (un-noticed) Interruptions is presented on the following basis: time-series analysis; responsibility analysis; density analysis; voltage level analysis and regional analysis. This is followed by a shorter analysis of the Planned Interruptions (time series and density analysis only[14]) and of Total (Planned and Unplanned) Interruptions. The actual levels of interruptions and more detailed charts can be found in Annex 2.

Unplanned Interruptions – National Aggregates (1999 – 2001)

Seven countries reported time-series data for Unplanned Interruptions for the three years, 1999-2001. Data for the year 2001 is also available for Portugal and Spain.
For the period 1999-2001, for unplanned interruptions the following trends are observed:

- Great Britain, France and the Netherlands, have an average annual CML consistently below 100 minutes lost per customer for each of the three years, 1999-2001.

14 Due to a lack of data, it is not possible to provide a responsibility analysis or regional analysis for planned interruptions for the year 2001.

FIG. 2.1 UNPLANNED INTERRUPTIONS
MINUTES LOST PER CUSTOMER PER YEAR (1999 – 2001)

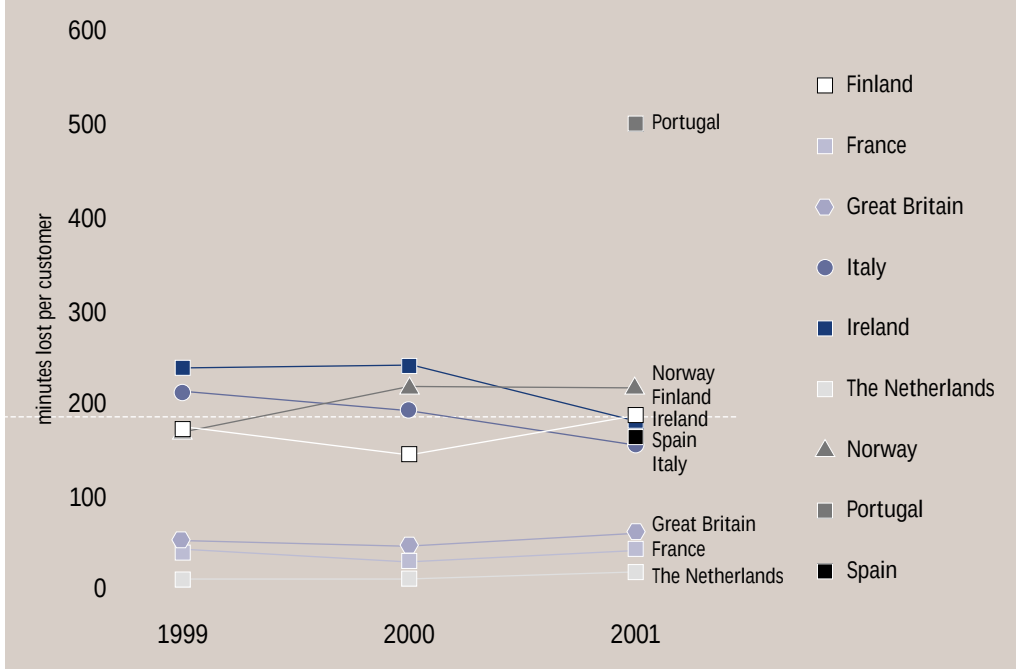
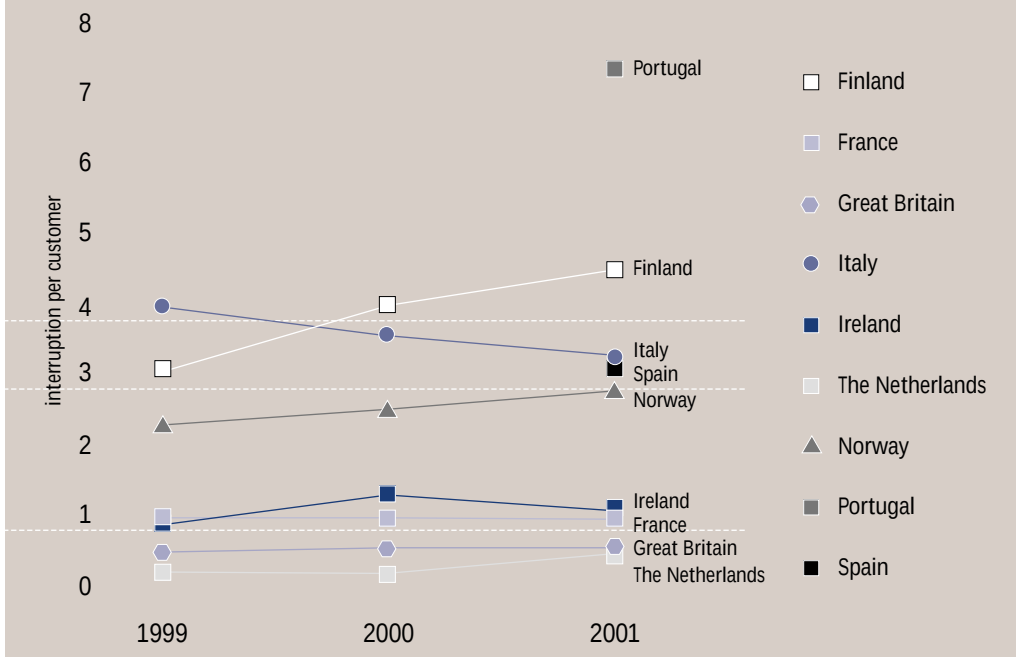


FIG. 2.2 UNPLANNED INTERRUPTIONS
INTERRUPTIONS PER CUSTOMER (1999 – 2001)

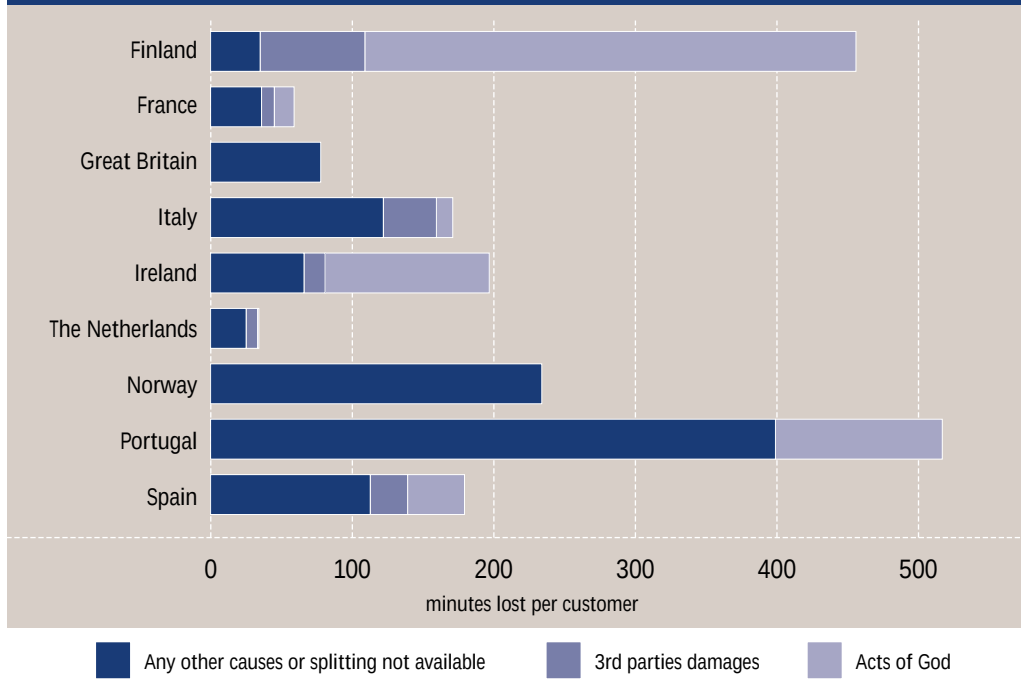


- Norway, Ireland, Italy and Finland[15] have an average annual CML within a 161 - 256 minute range for each of the three years. Spain also lies within this range for the year 2001, the only year for which it has available data.
- For the year 2001, Portugal report high national averages for minutes lost, of 531. This country experienced storms/Acts of God in 2001 (as can be seen from the Responsibility analysis section).
- Largely the same groups emerge from the data on the number of interruptions for the years 1999-2001, but with Ireland moving into the same group of best performers alongside Great Britain, France and the Netherlands. Again, the unplanned interruptions due to "Acts of God" in Portugal are (at least partially) responsible for the high number of unplanned interruptions in 2001.

Responsibility Analysis - Unplanned Interruptions (2001 National Data)

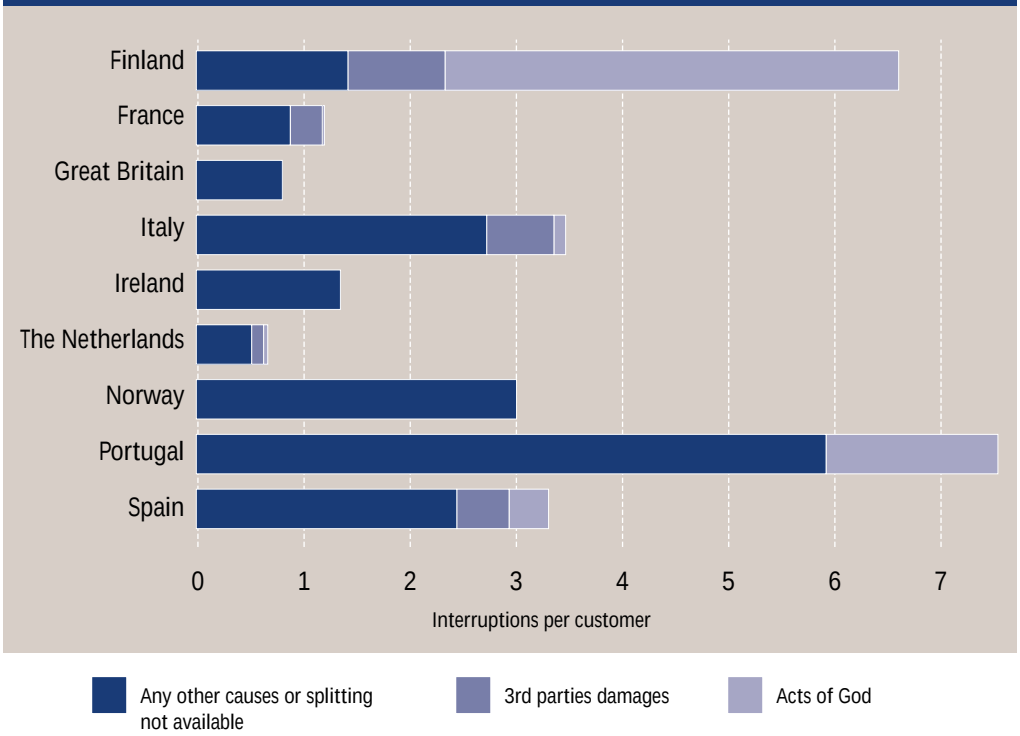
Figures 2.3 and 2.4 below show unplanned interruptions in 2001 split into three main categories (Acts of God, Third Party Damages and Utility) according to responsibility for the interruptions. More detailed charts displaying both the actual levels and the corresponding percentage analysis, according to responsibility for the unplanned interruptions, can be found in Annex 2 (Figures A and B respectively).

FIG. 2.3 UNPLANNED (UNNOTICED) INTERRUPTIONS - RESPONSIBILITY ANALYSIS MINUTES LOST PER CUSTOMER PER YEAR (2001)



15 To allow fair comparison with previous years, continuity data for Finland in year 2001 presented in this section are net of estimated effects of two very serious and rare storms (Pyry and Janika) that occurred in Finland in 2001. Data provided In the section 2.5.2 include all interruptions due to storms in 2001.

FIG. 2.4 UNPLANNED (UNNOTICED) INTERRUPTIONS - RESPONSIBILITY ANALYSIS
INTERRUPTIONS PER CUSTOMER PER YEAR (2001)



The following observations can be made on the Responsibility Analysis for unplanned interruptions:

- Six of the nine countries surveyed (the exceptions being Great Britain, Norway and Portugal) provided a responsibility analysis breakdown for CMLs.
- Five countries provided a responsibility analysis breakdown for the Number of Interruptions. Such a breakdown is not available for Ireland, Great Britain, Norway and Portugal.
- The splitting into the three main groups is interpreted differently across countries. For example, in Portugal "third party damages" are considered "fortuitous or *force Majeure* cases" and thus included in the "Acts of God". In Portugal, nationwide data is not available for the "Utility responsible" category, the data relating to utility responsibility is available on a density analysis (urban, semi-urban and rural areas).
- From the data, in Finland[16] in 2001, a disproportionate amount of the CMLs (76%) and the Number of Interruptions (64%) are attributed to Acts of God, reflecting the very severe storms experienced that year in Finland.

16 In this section Finland data included interruptions due to storms/Acts of God.

Density Analysis - Unplanned Interruptions (2001 National data)

Regulators were asked to provide a density level analysis of nationwide continuity levels for both planned and unplanned interruptions in the year 2001. The density analysis for planned interruptions can be found in this section.

The classification of continuity data on the basis of density level is a useful way, within a country, for a regulatory authority to monitor network performance in rural and urban areas. However, cross-country comparisons are complicated for the following reasons:

- Firstly, not all countries adopt a classification for density analysis. For example, while data for planned outages is available in Portugal for the whole country and for each of the 14 regions, data for planned outages is not available for a density level analysis (urban, semi-urban and rural).
- Secondly, even where such data exists, thresholds differ across countries. For example, in Finland, the "urban", "semi-urban" and "rural" classification is based of the percentage of the network which is underground cable. In the case of Ireland, territories are split on an urban/rural divide only, the split being determined by the length of overhead line. In the other three countries, the density classification is on the basis of population or customers concentration. "Semi-urban" in Italy corresponds to "medium concentration" which is a territorial area of between 5,000 and 50,000 inhabitants. "Semi-urban" in Spain is between 2,000 and 20,000 customers and in Portugal is between 5,000 and 25,000 customers.

Figures 2.5 and 2.6 below show the survey results for the following five countries; Finland, France, Ireland, Italy and Portugal, on the basis of an "urban", "semi-urban" and rural" classification.

The following observations can be made from the Density Analysis of unplanned interruptions:

- Five of the nine countries surveyed adopt some classification of customer density but thresholds are different across countries.
- Given different interpretations of what constitutes "urban", "rural" and "semi-urban" it is not possible to draw conclusions on whether rural customers in one country are relatively better or worse off than in another country.
- In all five countries, the CMLs and number of interruptions for rural customers (irrespective of the nature of the classification) is proportionately higher than for semi-urban or urban customers.

FIG. 2.5 UNPLANNED (UNNOTICED) INTERRUPTIONS - DENSITY LEVEL ANALYSIS
MINUTES LOST PER CUSTOMER PER YEAR (2001)

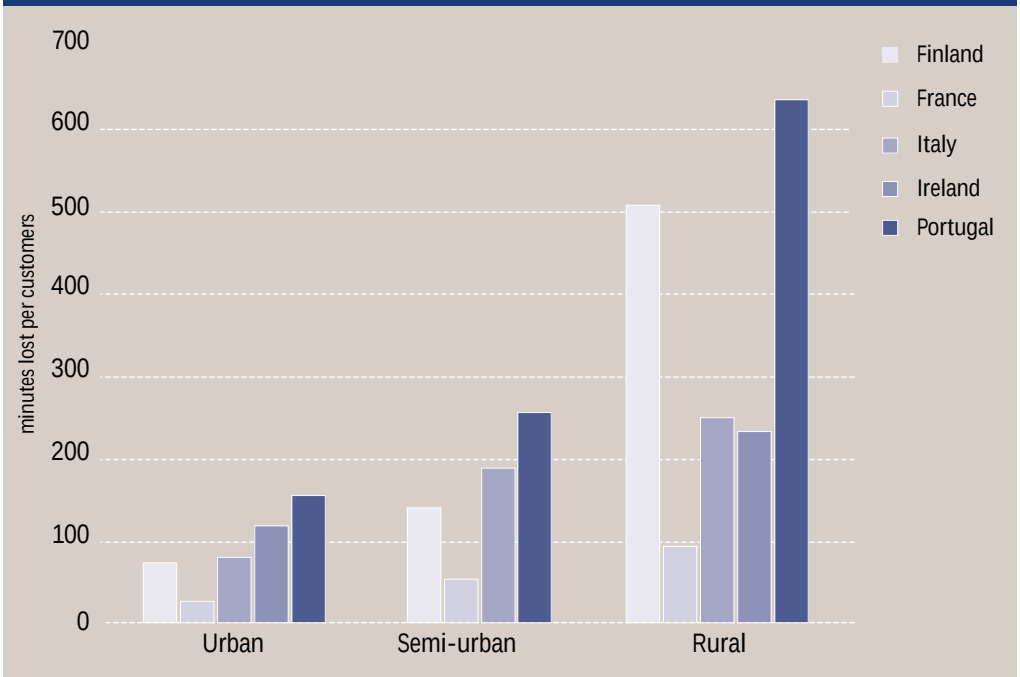


FIG. 2.6 UNPLANNED (UNNOTICED) INTERRUPTIONS - DENSITY LEVEL ANALYSIS
MINUTES LOST PER CUSTOMER (2001)

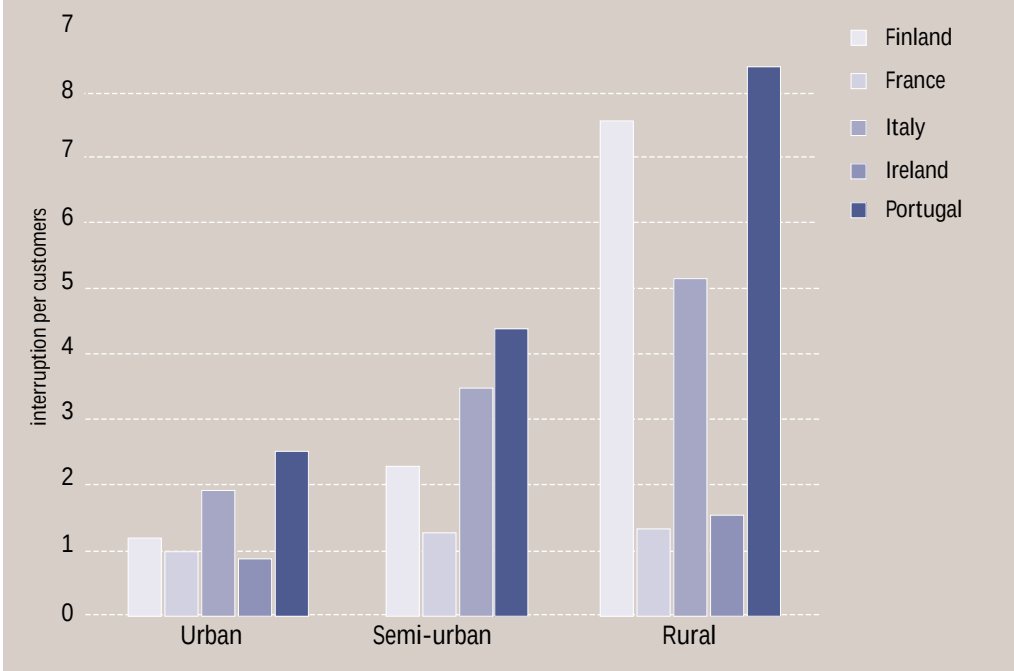
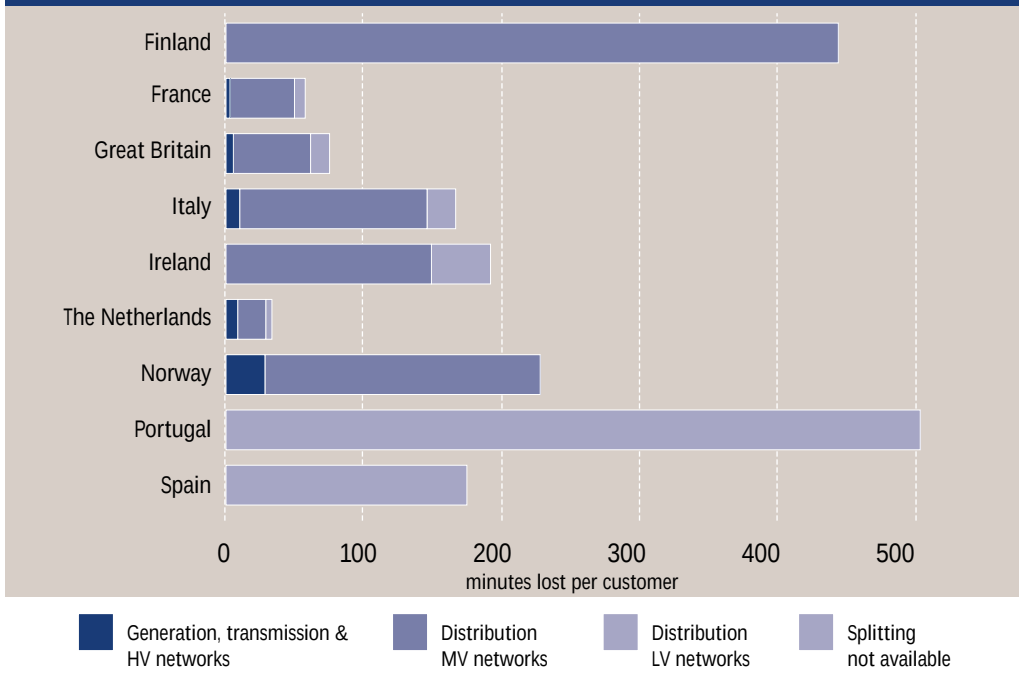


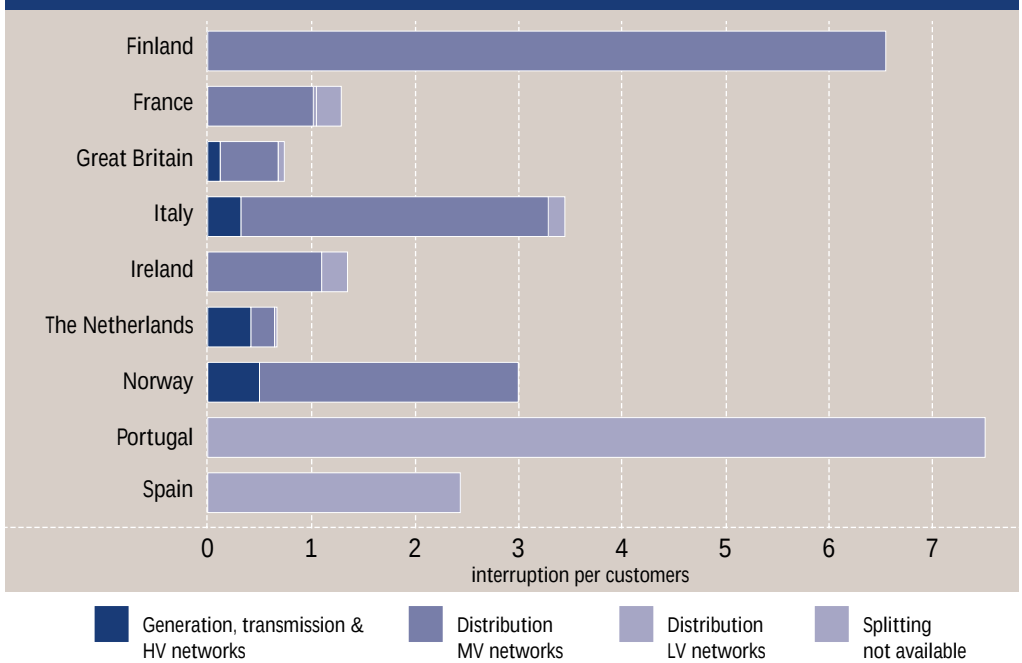
FIG. 2.7 UNPLANNED INTERRUPTIONS - VOLTAGE ANALYSIS
MINUTES LOST PER CUSTOMER PER YEAR (2001)



Voltage Level Analysis - Unplanned Interruptions (2001 National Data)

Figures 2.7 and 2.8 show unplanned interruptions in 2001 split into three main categories (Generation, Transmission and HV network (> 35kV); MV network (1kV-35kV) and LV network) according to voltage level.

FIG. 2.8 UNPLANNED INTERRUPTIONS - VOLTAGE LEVEL ANALYSIS
INTERRUPTIONS PER CUSTOMER PER YEAR (2001)



The following observations can be made:

- For duration, four countries (France, Great Britain, Ireland and the Netherlands) provided a voltage analysis for CMLs spilt across the three voltage categories. Splitting was not available in Spain or Portugal. In Norway, the breakdown was not possible below MV level. In Finland data was reported at MV level only. In Ireland, data was provided on the distribution networks (MV and LV) only.
- For frequency, three countries (Great Britain, Italy and the Netherlands) provided a voltage analysis for the Number of Unplanned Interruptions spilt across the three voltage categories. Partial splitting was available for a further three countries (Norway, Ireland and France). Finland only reported data at MV level.
- In Norway, LV faults and incidents are not included in the figures.
- In those countries where voltage level splitting is available, the highest proportion of average customer minutes lost occurs at the MV (distribution) network.
- In those countries where voltage level splitting is available, the highest proportion of average number of interruptions occurs at the MV (distribution) network.

Regional Analysis - Unplanned Interruptions (2001)

Annex 2 contains data set provided for regional analysis. The following observations can be made:

- In seven countries some data (for both continuity indicators) is available at a regional or district (province) level but the number of regions vary across countries.
- The dis-aggregated data shows sharp differences among regions and among districts in all countries where it is available. In Italy and Spain the geographical classifications can help to explain differences which arise for geographical reasons.

Regression Analysis of Duration and Frequency of Unplanned Interruptions using Regional Data

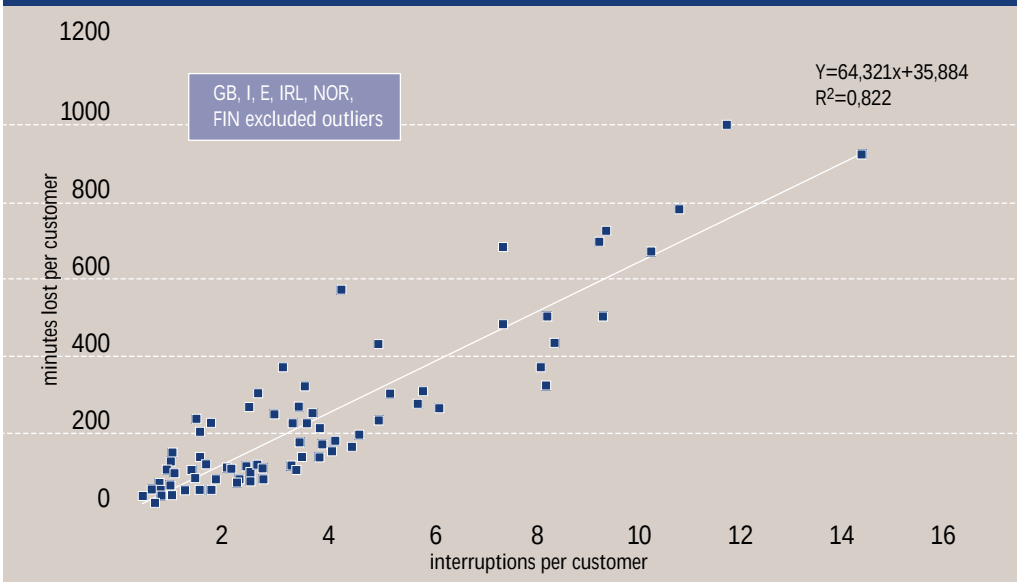
Customer Minutes Lost should equate to the multiple of the average duration of the interruption (minutes per interruption) times the number of Interruptions per customer plus approximately 3 minutes per customer (for so-called long interruptions). A positive correlation between CMLs and number of interruptions, using the regional data for 2001, is plotted in Figure 2.9.

The regression results show (with an R^2 of 0.82) an intercept of 3.5 minutes (which is in keeping with the definition of long term interruptions) and a slope of 64.321 minutes.

Correlation between Quality of Supply and Density

The number of supply interruptions is to a large extent dependent on whether a consumer is connected to an urban or rural network. This is because urban customers are generally supplied by underground cables whereas rural customers are supplied by overhead lines. One would expect high density levels (urban customers) to experience high levels of quality of supply (low number of interruptions for short periods).

FIG. 2.9 REGRESSION ANALYSIS OF THE DURATION AND FREQUENCY OF UNPLANNED INTERRUPTIONS USING REGIONAL DATA (2001)



Regional data for unplanned interruptions was used to try to explain at least a part of the sharp differences among regions by using a correlation with some physical index. Two different proxies for "density" are used. The first was the length of MV circuit, whereby a high average length would suggest low density. The results are shown in Figures 2.10 and 2.11 in for customer minutes lost and the number of unplanned interruptions respectively. This exercise was repeated, taking the number of customers per

FIG. 2.10 CMLS AND DENSITY (AVERAGE LENGTH OF MV CIRCUITS PER CUSTOMER) USING UNPLANNED INTERRUPTIONS REGIONAL DATA (2001)

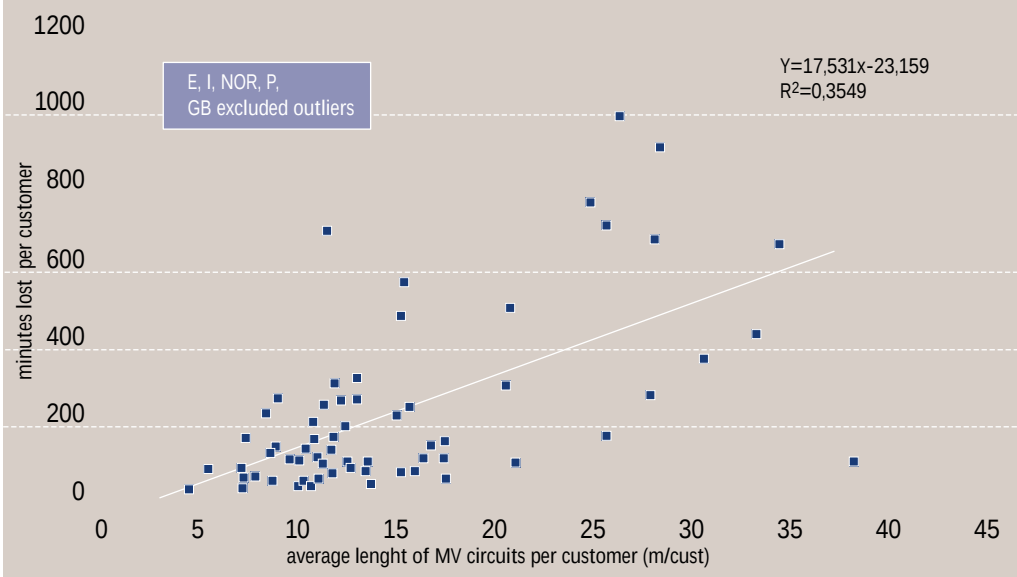
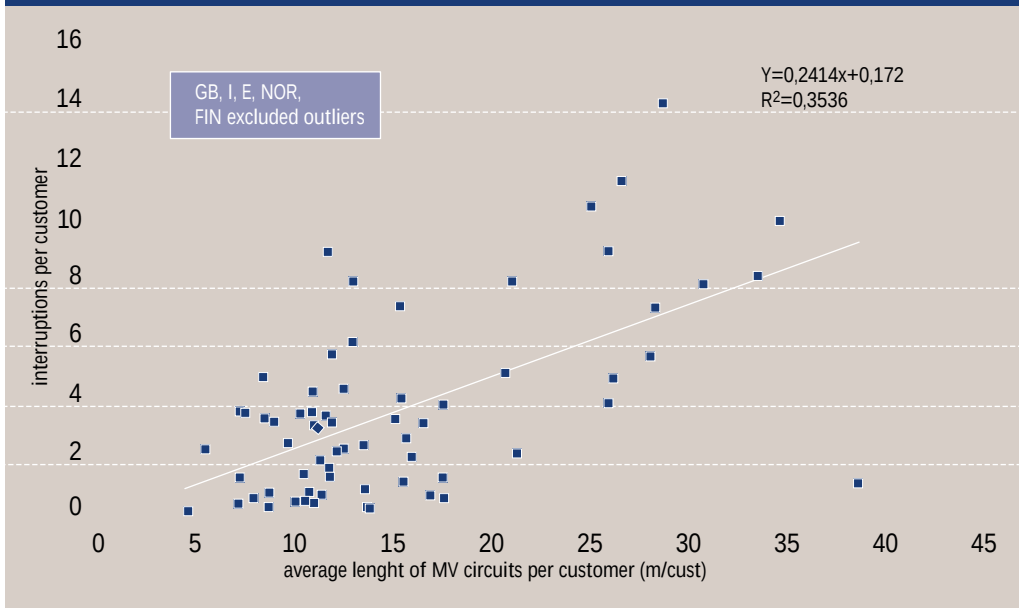


FIG. 2.11 NUMBER OF INTERRUPTIONS AND DENSITY (AVERAGE LENGTH OF MV CIRCUITS PER CUSTOMER) USING UNPLANNED INTERRUPTIONS REGIONAL DATA (2001)



Km² as the proxy for density. The results are shown in Figures 2.12 and 2.13 for customer minutes lost and the number of unplanned interruptions respectively. In all cases, R^2 were very low even if F-test is quite good. As expected, quality appears to decrease with lower levels of density, as indicated by the slopes in the graphs.

FIG. 2.12 CMLS AND DENSITY (CUSTOMER KM²) USING UNPLANNED INTERRUPTIONS REGIONAL DATA (2001)

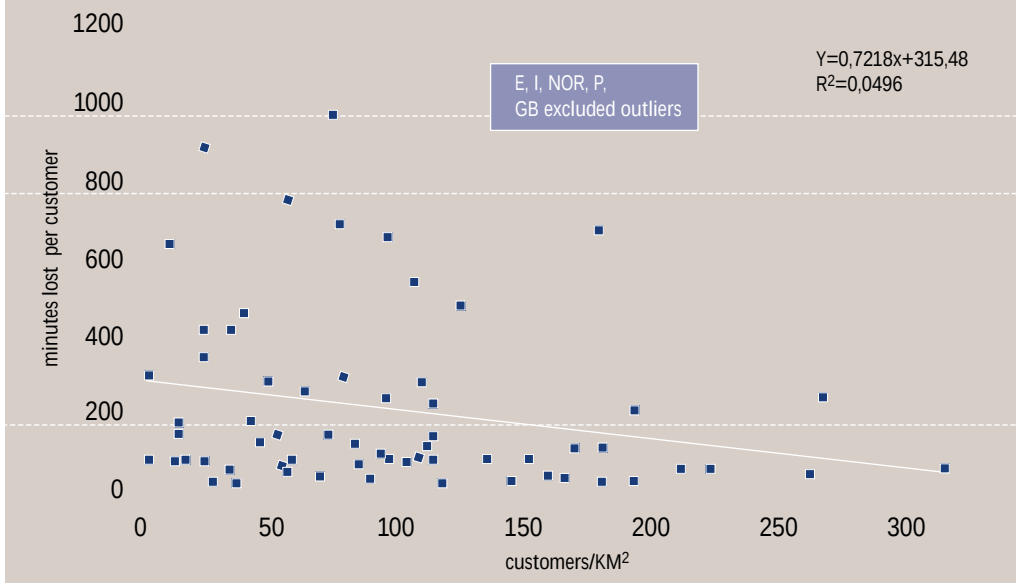
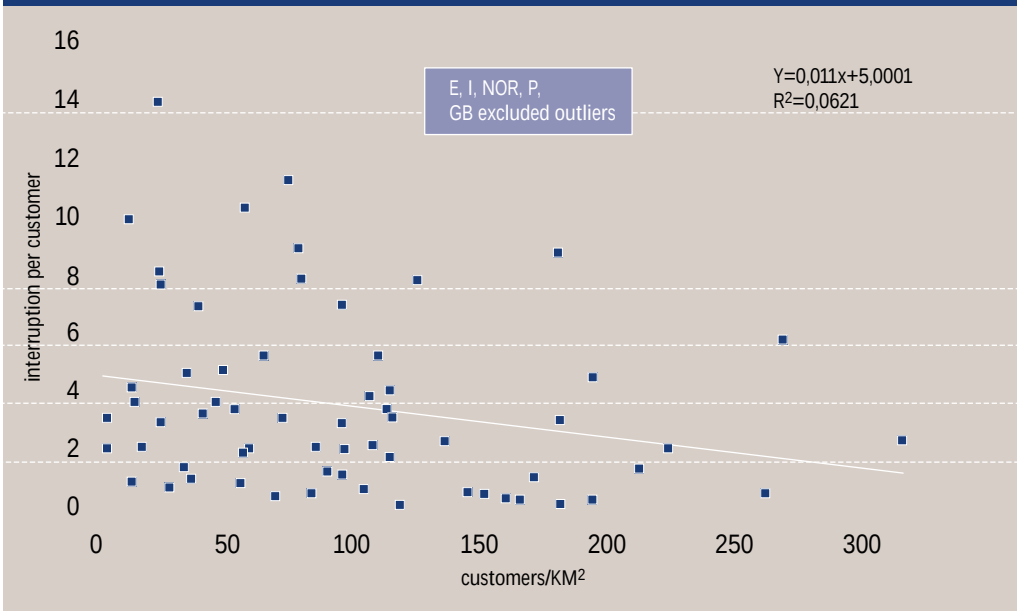


FIG. 2.13 NUMBER OF INTERRUPTIONS AND DENSITY (CUSTOMER KM²) USING UNPLANNED INTERRUPTIONS REGIONAL DATA (2001)



Planned – National Aggregates (1999 – 2001)

Five countries reported data on the levels of planned interruptions for each of the three years, 1999-2001. Data for planned interruptions is not available for the Netherlands. Partial data is also available for a further three countries, Italy for the latter two years, and year 2001 data for Portugal and Spain.

FIG. 2.14 PLANNED INTERRUPTIONS MINUTES LOST PER CUSTOMER (1999 – 2001)

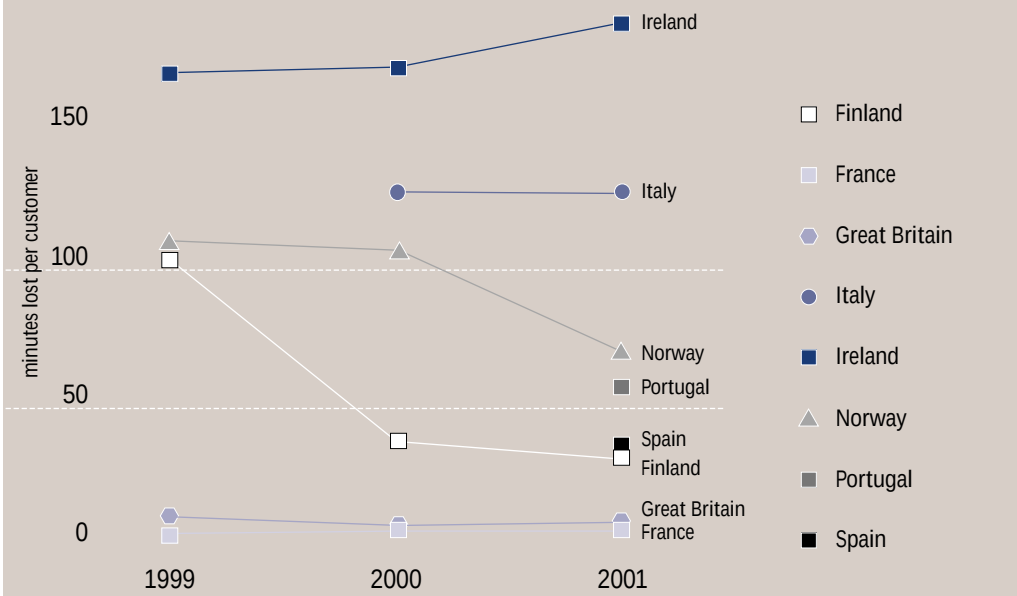
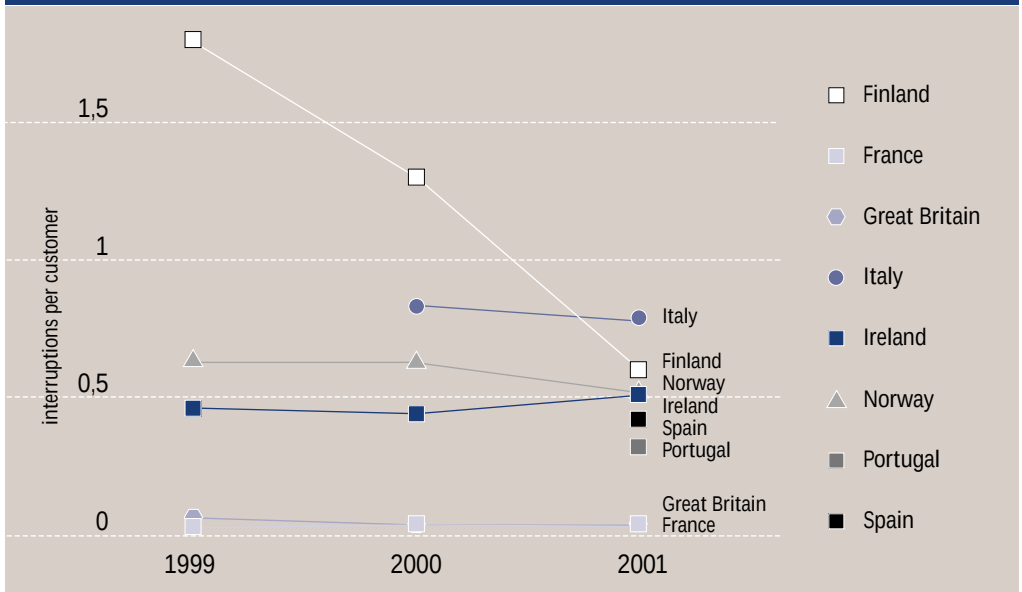


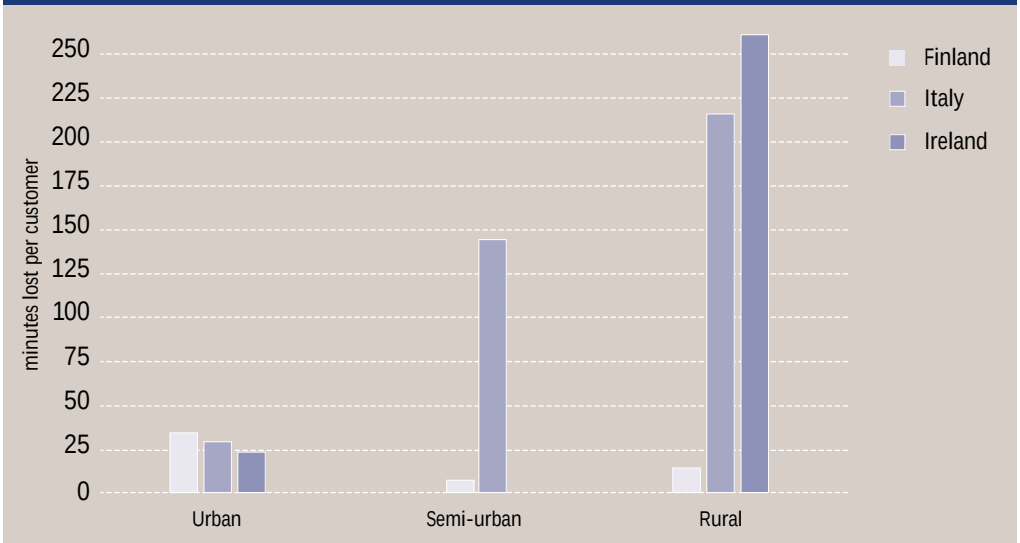
FIG. 2.15 PLANNED INTERRUPTIONS - INTERRUPTIONS PER CUSTOMER (1999 – 2001)



From the national time series data of "planned interruptions" the following trends are observed:

- France has an average CML of 6 minutes or less for each of the three years. Great Britain too has a relatively low and consistent level of annual average CML value (of between 8.12 and 10.95) for each of the three years.
- The data shows that Finland experienced a significant drop in the average number of customer minutes lost from a high of 103 minutes in 1999 to 38 in the year 2000. This levelled off to an average of 32 minutes in 2001, which is comparable to the average in Spain (in 2001) of 36.6 minutes lost.
- Norway also experienced a fall in planned interruptions, but with the fall occurring over the course of the latter two years (from 106 minutes lost in 2000 to 70 minutes lost in 2001). Portugal has a lower average CML of 57.37 minutes for 2001.
- In terms of the duration of outages, Ireland ranks highest for each of the three years, with average CML of 170 minutes in 1999 and 172 in year 2000 rising to 188 minutes lost on average per customer in 2001.
- With regard to the average number of interruptions per year, once again Great Britain and France show similar levels (of 0.05 or less) of planned interruptions, which are considerably less than in the other countries.
- Data for Italy is available for 2000 and 2001. Accordingly, Italy ranks relatively high both in terms of the average number of interruptions (126.57 and 127.4 respectively) and the average customer minutes lost (0.83 and 0.79 respectively) for both of these years.
- The number of planned interruptions in Finland fell by more than two thirds from 1999 (1.9) to the year 2000 (0.6).

FIG. 2.16 PLANNED INTERRUPTIONS – DENSITY ANALYSIS
MINUTES LOST PER CUSTOMER (2001)



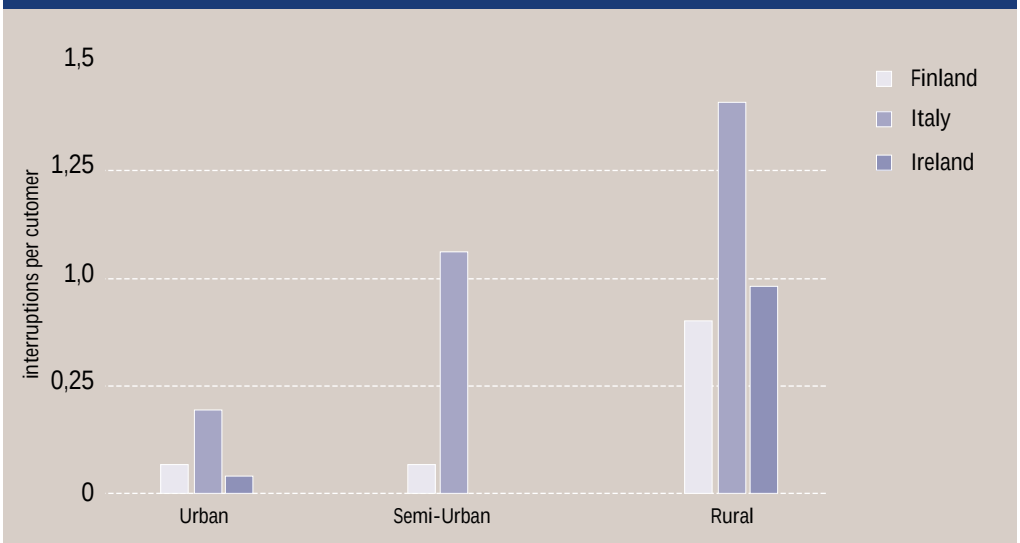
Density Analysis - Planned Interruptions (2001 National data)

Figures 2.16 and 2.17 show the survey results of the density analysis for planned interruptions in 2001.

The following observations can be made from the density analysis of planned interruptions:

- Density level analysis of planned interruptions is available for three countries only, namely Finland, Italy and Ireland.
- Given different interpretations of what constitutes “urban”, “rural” and “semi-ur-

FIG. 2.17 PLANNED INTERRUPTIONS – DENSITY ANALYSIS
INTERRUPTIONS PER CUSTOMER (2001)



ban" it is not possible to draw conclusions on whether rural customers in one country are relatively better or worse off than in another country.

- In all five countries, the CMLs and number of interruptions for rural customers (irrespective of the nature of the classification) are proportionately higher than for semi-urban or urban customers.

Total Interruptions (Unplanned and Planned) – Year 2001 National Data

Figures 2.18 and 2.19 below chart the total interruptions (planned and unplanned) in Year 2001 on the basis of Customer Minutes Lost and Number of Interruptions for the nine countries.

From the national data for total interruptions in 2001 the following observations can be made

- All countries (except Ireland and Italy) show proportionately higher averages (for both continuity indicators) for unplanned than planned interruptions.
- Significant differences are evident across countries with regard to the duration and frequency of (both planned and unplanned) interruptions to electricity supply.
- Countries can be grouped into three groups according to performance. The best performers, with the shortest average duration and lowest average number of interruptions, for (both planned and unplanned interruptions) are Great Britain, France and the Netherlands. Portugal and Finland[17] show very high averages for (CMLs and number of interruptions) unplanned interruptions in 2001. Spain, Norway and Italy have similar average number of unplanned interruptions, with Ireland's average closer to that of the best performers (described above). Spain, Norway, Ireland and Italy are on a par for the average duration of unplanned interruptions.
- For Ireland and Italy, the relatively high average duration for planned outages skews their averages for total duration of interruptions in 2001 upwards.

Summary of Benchmarking of Actual Levels of Continuity of Supply

The results obtained from the above analysis leads to the following comments:

- Significant differences arise across countries with regard to the duration and frequency of (of both planned and unplanned) interruptions to electricity supply.
- All countries record proportionately higher averages for unplanned than planned interruptions. The planned/unplanned is not a good classification and should be substituted by notified/un-notified. Using this classification, a planned interruption must be notified in advance to the customer otherwise it equivalent to un-

17 Finland data included interruptions due to storms/Acts of God.

FIG. 2.18 UNPLANNED AND PLANNED INTERRUPTIONS
MINUTES LOST PER CUSTOMER (2001)

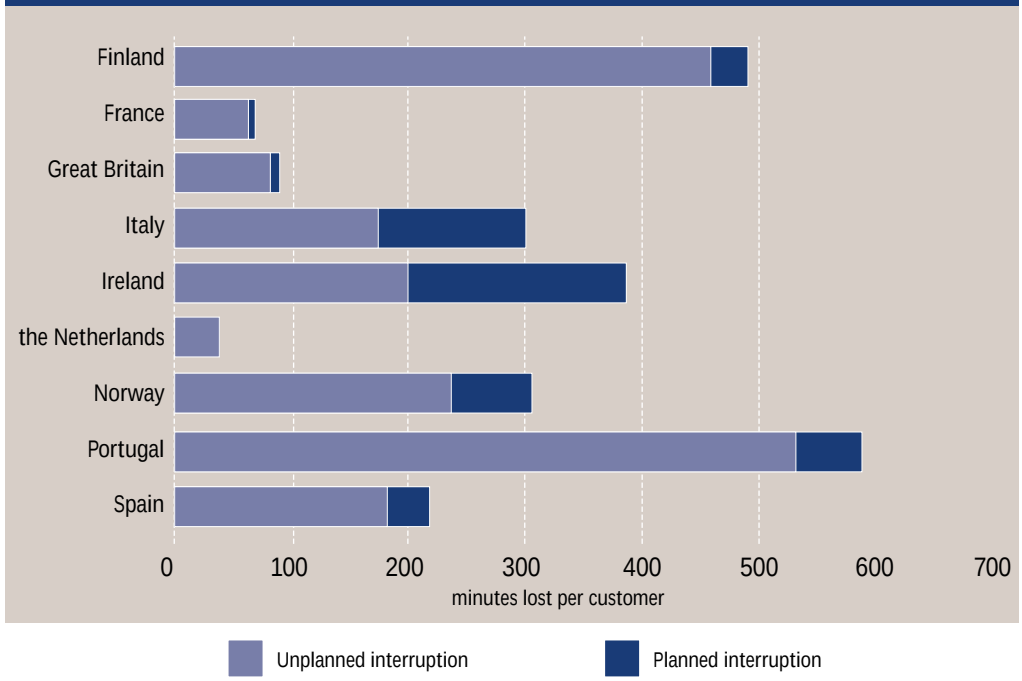
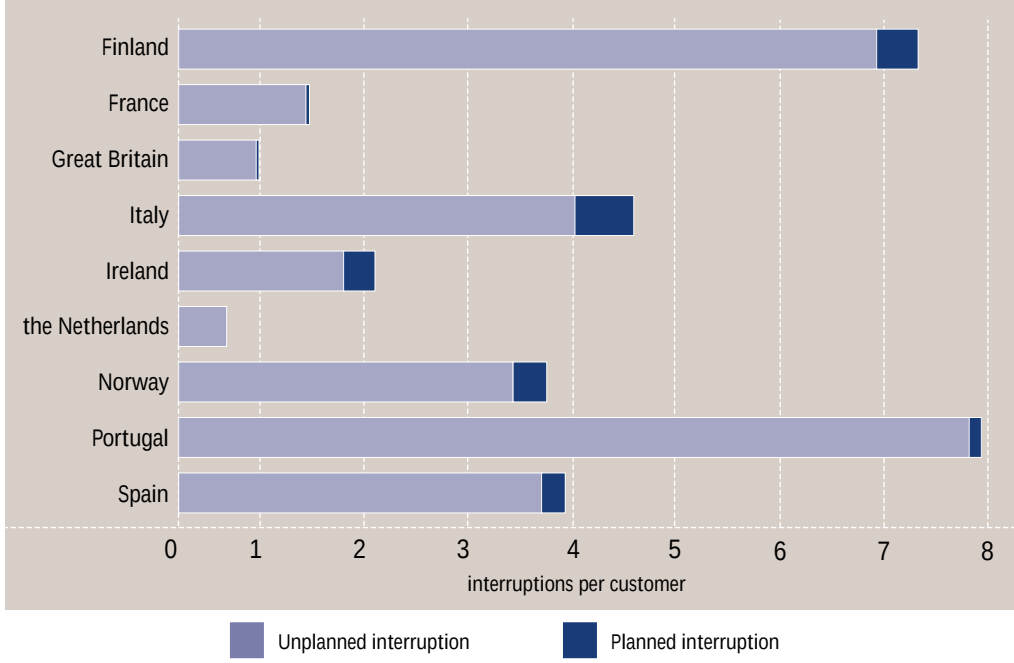


FIG. 2.19 UNPLANNED AND PLANNED INTERRUPTIONS
INTERRUPTIONS PER CUSTOMER (2001)



planned in the customer's viewpoint.

- These differences may reflect a number of factors including different weighting measures for continuity indicators, the different stages of countries in terms of network development, geographical difference and weather conditions and the characteristics of the network.
- Networks that are underdeveloped, like in Ireland, or that are under huge refurbishment, like in Italy, rank high in terms of planned interruptions, because of the necessary planned interruptions to roll out programme of capital investment in the network. Nonetheless, lower levels of planned interruptions (like in France and Great Britain) can depend also upon the way works are done (for instance "live works" as in France permit to squeeze planned interruptions).
- The characteristics of the networks can cause wide variations in the measures, with countries with high levels of underground cable (such as the Netherlands) expected to perform better than those characterised by overhead lines which are more prone to faults due to weather conditions and need more frequent replacement or refurbishment.
- Density analysis comparison across countries is not possible because some countries do not adopt a classification for density and even where data exists in this form, the thresholds differ across countries.
- Responsibility analysis comparison was limited because the splitting of interruptions into three main groups (Acts of God, damages and Utility responsible) is differently interpreted across countries.
- In all countries which provided data on unplanned interruptions split according to voltage levels, the interruptions originating at MV account for the bulk of the interruptions (in terms of duration and frequency).
- Significant variations in both the frequency and duration of interruptions exist across regions of European countries.

3 CONCLUSIONS AND RECOMMENDATIONS

There is growing consensus amongst both regulators and regulated companies that quality forms an essential part of the regulatory framework. Quality – in the context of electricity network services - has three main aspects namely, commercial quality, continuity of supply and voltage quality. This report presents the results from a survey conducted by the CEER Working Group on Quality of Supply.

In particular, two items are treated in this report. First, a comparison and analysis of the standards used for regulating commercial quality, and second, a detailed comparison of levels of continuity of supply in the participating countries. Ten countries actively participated to the Working Group and supplied relevant information for benchmarking.

3.1 Commercial Quality

The results from the survey indicate that regulation of commercial quality remains an important regulatory activity. With the exception of a couple of countries, all surveyed regulators make use of standards - either Guaranteed or Overall. These standards are usually applied to occasional transactions such as response to customer complaints, estimating charges for simple works, connections or queries on charges and payments. Standards for regular transactions (such a billing or meters reading) are less.

In most cases, automatic refunds to customers are used when commercial quality guaranteed standards are not complied with. Automatic refunds guarantee that for each violation an individual penalty is paid, while refunds on request from the affected customer generally don't.

As could be expected, practical implementation of standards – in terms of setting the standard level and penalty involved - differs between regulators. This diversity is likely driven by a number of factors such as the historical quality levels, the regulatory framework, the industry structure, the customer needs, perceptions and expectations etc. The recognition of the importance of commercial quality regulation however remains persistent in all countries.

For commercial quality regulation it is important to make a distinction between regulation of supply and that of distribution, plus metering than may be either separated or not from other activities. As competition evolves, attention for supply regulation is likely to decrease. The survey showed that countries with full market opening

have relatively less regulation of supply in place. This trend can therefore also be expected in countries where markets are now gradually opening up. When modifications are made for commercial service standards in electricity supply, the pace of these modifications follows the real development of competition more than the legal eligibility thresholds, until such time as the relevant regulatory authority is satisfied that competition is sufficiently developed to provide the necessary incentives to improve performance. For distribution, where most of commercial quality standards usually are focused, regulation of commercial quality tends to remain in place, and even strengthened in the case of further liberalization.

3.2 Continuity of Supply

Compared to the first report of the working group, the comparisons of continuity of supply levels have improved in different ways. First, the number of countries included in the comparison has been extended. Second, the comparisons are now more detailed, a distinction is made between planned and unplanned outages, different voltage levels and load density areas as well as a classification of the outage by its cause (internal, external, and Acts if God or *force majeure*). However, due to data limitations, these detailed comparisons could not be carried out for all countries. This suggests that further harmonization of data and definitions between regulators remains essential.

Based on the comparison of continuity of supply indicators – both planned and unplanned – countries can be classified into three groups. First, the Netherlands, Great Britain and France are the best performers with very low frequency and duration of outages. The second group contains Spain, Italy, Norway and Ireland with higher frequency and duration, followed then by Finland and Portugal with the most and longest outages.

For unplanned outages, further analysis shows that some countries with historically good continuity of supply levels (in particular the Netherlands) are now experiencing more and longer outages. On the contrary, for some countries with historically lower continuity of supply, significant improvements have taken place (in particular Italy).

A first attempt has been made in the Report to analyze possible explanatory factors for differences in the observed continuity of supply between countries.

For planned outages, a significant decrease in Norway and Finland can be detected, thus suggesting a decrease in maintenance or investment activities. On the contrary, planned outages are increasing in Ireland whilst for the other countries, they remains roughly the same.

On the whole, no relevant signals of quality of supply decrease are emerging in European countries even after utilities privatization, increasing supply competition, price-cap regulation for monopolistic activities and legal unbundling of businesses, if any.

Rather, many positive results have been achieved in terms of quality increase when appropriate policy instruments are put in place. Quality of supply regulation is becoming more and more important in all European countries, and regulation is working positively, even if different approaches and methodologies may be used in different countries. A mix of moral suasion, comparative publication of companies' performance, standards for worse-served customers and incentive/penalties mechanisms is used in most countries.

Regulators also issued rules for interruptions recording and measurement; audit procedures have also been introduced in most countries where some kind of continuity of supply regulation has been put in place, as shown in Annex 2. Measurement rules and audit procedures become more important when some kind of economic incentive and disincentive is used to promote continuity of supply enhancement.

Investigating the underlying drivers for the above mentioned trends, for example the impact of regulation, is an interesting topic for future research. Even more interesting may be to evaluate the possible impact of these trends on the longer term.

Further cooperation between regulators and improving transparency of data remains essential in conducting such efforts.

3.3 Next Steps

The CEER Working Group on Quality of supply firstly recognizes that differences in measuring quality actual levels still obstacle a complete benchmarking both for continuity and commercial quality. Secondly, data collected are only seldom audited by regulators, indeed data quality is a major issue and a prerequisite for sound regulation. Thirdly, quality regulation is a way to introduce the customer view in the economic incentives for regulated companies, but so far only a little research has been conducted on the customer perspective.

Therefore, the CEER Working Group on Quality of supply identifies three main directions for further work:

A. Harmonization of continuity indicators measurement

- diffusion of common indicators (so far the most common ones for continuity are SAIDI-CML, SAIFI-CIs, CAIDI=SAIDI/SAIFI; also MAIFI should be become common-

ly used, due the importance of short interruptions especially for non domestic customers);

- joint work on both classification of Acts of God (*force majeure*) and classification of density levels, that enable for a more meaningful comparison of actual continuity levels;
- further research on correlation between continuity levels and demand/territory characteristics.

B. Data quality, i.e. audit of quality data

- Annex 2 contains some reference cases for audit of continuity data that could be discussed in detail in a more specific seminar;
- further work should be developed in order both to share common methodologies for sample control of interruptions and to widespread capabilities among consultants that could exercise audits on behalf of regulators.

C. The customer perspective

- research is needed to understand better customer satisfaction, customer expectations and customer willingness to pay;
- quality contracts can be a useful tool to reveal customer preferences; regulators should use this market-like tool in order to satisfy special quality needs without increasing distribution tariffs.

ANNEX 1 - DETAILED DATA ON COMMERCIAL QUALITY

TABLE 1 – ACTUAL LEVELS OF COMMERCIAL QUALITY (YEAR 2001)

	FRANCE	IRELAND	ITALY	PORTUGAL
Average waiting time in customer centres	> 20 min	< 1 min per payment transaction	n.a.	n.a.
No. of Visits per 100 customers in customer centres	30	400 (mainly pay bill)	n.a.	n.a.
Average waiting time in call centres	n.a.	101 sec	n.a.	162 sec
No. of calls per 100 customers in call centres	100	154	n.a.	102.3
No. of complaints per 100 customers	n.a.	0.64	0.17[1]	0.70
Average response times to customer complaints	n.a.	n.a.	10.29 work days	19.75 work days
Average response times to customer written queries	n.a.	n.a.	10.29 work days	n.a.
Average annual meter reading per customer	1.78	3.8	0.947 (LV)	2.0 1.96 (LV)
Average annual self meter reading	0.09	3%	n.a.	n.a.
Percentage of estimated bills	0.13 %	33.61%	n.a.	18.5%[2]
No. of revised bills per 100 customers	0.8	2.3	0.045 (% LV)	3.17
Average response time for LV supply quotations	n.a.	16 days	9.45 days, E 7.49 days, O	n.a.
Average time to connect a new LV customer	n.a.	22 weeks	1.16 days, E 2.28 days, O	n.a.
Average time to provide meter and supply after supply contract	n.a.	n.ap.	5.72 days, E 2.28 days, O	2.8 days (LV)

n.a. = not available, n. ap. = not applicable

Italy has reported separate figures for the incumbent Enel (E) and/or for Others (O) (as distinct from national averages) for the last thee indicators.

1 For the incumbent (Enel)

2 For LV, power < 41.4 kVA

TABLE 2 – SURVEY RESULTS OF COMMERCIAL QUALITY STANDARDS

SERVICE	GS/ OS	FRANCE		GREAT BRITAIN		IRELAND		THE NETHERLANDS		ITALY		PORTUGAL		SPAIN	
		Standard	Penalty	Standard	Penalty[3]	Standard	Penalty[4]	Standard	Penalty	Standard	Penalty[5]	Standard	Penalty[6]	Standard	Penalty
Responding to failure of supplier's fuse	GS	3 hrs (breakdown service)	25	3hrs weekdays 4hrs on any other day	29.05	3 hrs if call between 08.30 - 23.00, otherwise the following day	35					4 hrs in Area A and B; 5 hrs in Area C (rural areas)	15 * **		
	OS							2 hours							
Restoring supply	GS			18hrs GB also pays 72.63 penalty for multiple interruptions (4 or more interruptions of not less than 3 hours over 12 month period	72.63 145.26 for non-domestic	If without power for 24 hours – penalty applies. After 24 hours, further 35 for every additional hour without power	65								
	OS			99.5% within 18 hrs		95% within 4 hrs						80% within 4 hours			
Connection (supply and meter)	GS	2 working days (99,9 % success)	25	2 days domestic 4 days non-domestic	29.05	Meter Connection - 3 working days for domestic customers, 5 working days for businesses. For a new Connection within 2 weeks of receipt of ETCI certificate (provided the customer has applied and paid for the connection at last 10 weeks prior to the completion of electrical installation	Metering 50 Connection 50			5 working days LV 7 working days MV	25.82 * **			5 working days following contract sign	Max. of 30 or 10% of the first full bill
	OS		25	100% in 30 days domestic, 40 days non-domestic								90% within 2 working days following contract signature			

[3] Penalty payment reported for Great Britain is for domestic customers. For a given Guaranteed Standard, payments to non-domestic customer are the same as for domestic customers unless stated otherwise. For comparison purposes payments are converted from Sterling into the Euro equivalent, exchange rate 1.45255.

[4] Penalty payment reported for Ireland is for domestic customer. Payments to business customers are 130 and are marked by *.

[5] Penalty Payment reported for Italy is for LV domestic customer. Payments to LV Business are 51.65 (and are marked by*) and to MV customers are 103.29 (and are marked by**)

[6] Penalty Payment reported for Portugal is for LV domestic customer, P < 20.7 kVA. Payments for LV P> 20.7 kVA are 25 (and are marked by*) and to MV, HV, VHV customers are 75 (and are marked by**)

TABLE 2 - (CONTINUE) SURVEY RESULTS OF COMMERCIAL QUALITY STANDARDS

SERVICE	GS/ OS	FRANCE		GREAT BRITAIN		IRELAND		THE NETHERLANDS		ITALY		PORTUGAL		SPAIN	
		Standard	Penalty	Standard	Penalty[3]	Standard	Penalty[4]	Standard	Penalty	Standard	Penalty[5]	Standard	Penalty[6]	Standard	Penalty
Estimating Charges for Simple works	GS	8 days (= 6 working days)	25	5 days simple jobs 15 days other jobs	58.10	7 Working days when no site visit is required, 15 working days when site visit required. > 100KW or MV connections –90 Working days.	65 *			Within 15 working days for simple works LV	25.82			LV: a) supplies <15 kW: within 5 days; b) Other without Substation investment: within 10 days; c) Other supplies with Substation investment: within a range of 20 to 30 days. MVHV: (new supplies): a) 1-66kV: within 40 days; b) >66kV: within 60 days	Max. of 30 or 10% of the first full bill.
	OS											95% within 20 working days for simple LV works			
Notice of supply interruption	GS			2 days	29.05 58.10 for non-domestic	Minimum 2 working days.customer must claim within 1 month of supply interruption	65 *								
	OS							3 days in advance				36 hours in advance[5]		Minimum of 24 hours in advance	Incl. in continuity of supply Penalty
Voltage complaints	GS			Reply within 5 days or visit within 7 days	29.05	10 working days to contact complainant, further 10 working days to investigate	35					Respond or visit within 20 working days	15 * **		
	OS							For non-eligible customers, visits within 2 hours, response to mail 10 working days		90% LV and 95% MV reply within 10 working days					
Meter problems	GS			Reply within 5 days or visit within 7 days	29.05	Within 5 working days for Meter accuracy check	35					Visit within 20 working days	15 * **	Customers: < 15 kW: within 5 working days Rest: within 15 working days	Max. of 30 or 10% of the first full bill

[5] This is not an overall standard defined in the Quality of Service Code, but a commercial regulation established in the Commercial Relations Code.

TABLE 2 - (CONTINUE) SURVEY RESULTS OF COMMERCIAL QUALITY STANDARDS

SERVICE	GS/ OS	FRANCE		GREAT BRITAIN		IRELAND		THE NETHERLANDS		ITALY		PORTUGAL		SPAIN	
		Standard	Penalty	Standard	Penalty[3]	Standard	Penalty[4]	Standard	Penalty	Standard	Penalty[5]	Standard	Penalty[6]	Standard	Penalty
	OS							For non-eligible customers, visits within 2 hours, response to mail 10 working days		90% LV and 95% MV reply within 10 working days					
Queries on charges and payments	GS			5 days	29.05	5 working days	35					Respond within 20 working day	15 * **	Customers: < 15 kW: within 5 working days Rest: within 15 working days	Max. of 30 or 10% of the first full bill.
	OS							within 10 working days		90% LV and 95% MV within 15 working days					
Appointments scheduling	GS	2 hours (99.6 % success)	25	Am or pm, or timed if customer requests	29.05	AM or PM offered	35			Within 3 hours range	25.82 * - **	Within 3 hours range	15 * - **		
	OS							Time blocks of two hours							
Payments notice under standards	GS			10 days to pay	29.05	within 10 days	35								
	OS														
Prepayment meter fault	GS			3hrs weekdays 4hrs weekends	29.05										
	OS														
Correction of voltage faults	GS					12 weeks, except where significant network reinforcement is required	50								
	OS			100% in 6 months											
Visits to customers who required a meter move	GS					AM or PM appointments	35			Included in execution of simple works	25.82 *				
	OS			100% in 30 days											
Meters changed when required	GS														

TABLE 2 - (CONTINUE) SURVEY RESULTS OF COMMERCIAL QUALITY STANDARDS

SERVICE	GS/ OS	FRANCE		GREAT BRITAIN		IRELAND		THE NETHERLANDS		ITALY		PORTUGAL		SPAIN	
		Standard	Penalty	Standard	Penalty[3]	Standard	Penalty[4]	Standard	Penalty	Standard	Penalty[5]	Standard	Penalty[6]	Standard	Penalty
	OS			100% in 30 days											
Number of meter readings within a year	GS													Min. of 6 times per year	Max. of 30 or 10% of the first full bill
	OS	2 (1.77 realised)		100%, one reading per year		Currently 5 times, to be phased to 4				95% LV and 95% MV with at least 1 within a year		98% with, at least 1 reading, within a year (only for LV)			
Response to customers letters	GS	8 days (= 6 Work days) (99.8 % success.)	25, if letter really necess.												
	OS			100% in 10 days		95% within 10 working days (substantive response)		within 10 working days		90% LV and 95% MV within 20 working days		90% within 20 working days			
Response to customer claims	GS	8 days (=6 work days)	25, if claim really necess.			Refund guarantee on both electricity bill and connection charge –within 5 working days of agreeing amount to be repaid	35							Customers: < 15 kW: within 5 working days Rest: within 15 working days	Max. of 30 or 10% of the first full bill
	OS					75% calls to contact centre answered within 20 seconds		within 10 working days		90% LV and 95% MV within 20 working days		95% within 20 working days			
Execution of simple works	GS	15 days(= 11 work days), after payment of estimate)	25							Within 15 working days for LV customers	25.82	95% within 30 working days (LV works)		LV: (new supplies) Without LV network extension: within 5 working days following connection rates payment. With LV network extension: within 30 working days following connection rates payment	Max. of 30 or 10% of the first full bill
	OS							Within 3 day							

TABLE 2 - (CONTINUE) SURVEY RESULTS OF COMMERCIAL QUALITY STANDARDS

SERVICE	GS/ OS	FRANCE		GREAT BRITAIN		IRELAND		THE NETHERLANDS		ITALY		PORTUGAL		SPAIN	
		Standard	Penalty	Standard	Penalty[3]	Standard	Penalty[4]	Standard	Penalty	Standard	Penalty[5]	Standard	Penalty[6]	Standard	Penalty
Desactivation on customer's request	GS	2 working days (99.8 % successf)	25							Within 5 working days LV Within 7 working days MV	25.82 **			Within a month	Max. of 30 or 10% of the first full bill
	OS														
Reconnection following lack of payment	GS									Within 1 working day (including Saturday)	25.82 **	LV – until 5 PM next day Non LV – within 8 hours	15 * **	A maximum of 24 hours after paying the bill	Max. of 30 or 10% of the first full bill
	OS	24 h (except week end)		100% by end of the day											
Estimating charges for complex works	GS														
	OS									85% LV and 80% MV within 40 working days					
Execution of complex works	GS														
	OS							Within 10 days		85% LV and 80% MV within 60 working days					
Accuracy of bills made on estimations	GS														
	OS									<150% 85% LV house hold and <250% LV industry (*)					
Attendance in customers centres	GS														
	OS											90% within 30 minutes			

TABLE 2 - (CONTINUE) SURVEY RESULTS OF COMMERCIAL QUALITY STANDARDS

SERVICE	GS/ OS	FRANCE		GREAT BRITAIN		IRELAND		THE NETHERLANDS		ITALY		PORTUGAL		SPAIN	
		Standard	Penalty	Standard	Penalty[3]	Standard	Penalty[4]	Standard	Penalty	Standard	Penalty[5]	Standard	Penalty[6]	Standard	Penalty
Attendance in telephone service	GS														
	OS	95% must get a personal (rather than recorded) answer (98% success)				75% within 20 seconds (call centre phone), 5% call abandonment rate						75% within 60 seconds			

GS – Guaranteed Standards;

OS – Overall Standards

TABLE 3 – OVERVIEW OF GUARANTEED AND OVERALL STANDARDS

SERVICE	GS/ OS	FRANCE	GREAT BRITAIN	IRELAND	ITALY	THE NETHERLANDS	PORTUGAL	SPAIN
		Standard	Standard	Standard	Standard	Standard	Standard	Standard
Responding to failure of ssupplier's fuse	GS							
	OS							
Restoring/ reconnecting supply	GS							
	OS							
Connection (supply and meter)	GS							
	OS							
Estimating Charges for Simple Works	GS							
	OS							
Notice of supply interruption	GS							
	OS						*	
Voltage complaints	GS							
	OS							
Meter probems	GS							
	OS							
Queries on charges and payments	GS							
	OS							
Appointments scheduling	GS							
	OS							
Payments notice under standards	GS							
	OS							
Prepayment meter fault	GS							
	OS							
Correction of voltage faults	GS							
	OS							
Visits to customers who required a meter move	GS							
	OS							
Meters changed when required	GS							
	OS							
Number of meter readings within a year	GS							
	OS							

* It is not an overall standard defined in the Quality of Service Code, but a commercial regulation established in the Commercial Relations Code.

TABLE 3 – (CONTINUE) OVERVIEW OF GUARANTEED AND OVERALL STANDARDS

SERVICE	GS/ OS	FRANCE	GREAT BRITAIN	IRELAND	ITALY	THE NETHERLANDS	PORTUGAL	SPAIN
		Standard	Standard	Standard	Standard	Standard	Standard	Standard
Response to customers letters	GS							
	OS							
Response to customer claims	GS							
	OS							
Execution of simple works	GS							
	OS							
Desactivation on customer's request	GS							
	OS							
Reconnection following lack of payment	GS							
	OS							
Estimating charges for complex works	GS							
	OS							
Execution of complex works	GS							
	OS							
Accuracy of bills made on estimations	GS							
	OS							
Attendance in customer centres	GS							
	OS							
Attendance in telephone services	GS							
	OS							
Tot No. of Guaranteed Standards	GS	8	11	13	7	0	6	9
Tot No. of Overall Standards	OS	2	8	7	9	10	9	1
Tot No. of Performance Standards	Total	10	19	20	16	10	15	10

= where Overall Standard (OS) is in place; = where Guaranteed Standard (GS) is in place

TABLE 4 - OVERVIEW OF GUARANTEED AND OVERALL STANDARDS

TABLE 4.1 HAS THE REGULATOR CHANGED THE COMMERCIAL QUALITY REGULATION TO ADAPT IT TO THE LIBERALISATION PROCESS (ESPECIALLY IN RESPECT OF SUPPLY LIBERALISATION AND/OR SEPARATION BETWEEN DISTRIBUTION AND SUPPLY)?	
AUSTRIA	The regulator has not changed commercial quality regulation yet.
FINLAND	The Electricity Market Act defines the responsibility of the network owner. The regulator have very little to do with the commercial quality regulations which are in most cases only recommendations made by the Finnish Electricity Association.
FRANCE	There is no commercial quality regulation in France: the only rules are based either on contractual relations or on good behaviour principles.
GREAT BRITAIN	Commercial quality standards are split to reflect the distinction between distribution and supply. These are referred to as Guaranteed and Overall standards of performance. The distribution standards deal with network issues and the supply standards with supplier hub activities.
IRELAND	Yes, Connection Agreement and Metering Codes contain certain commercial quality elements. Separate Customer Charters for Networks and Supply have been developed. The Networks charter contains 12 guaranteed standards and the Supply Charter has 7 guaranteed services.
ITALY	Yes, it did. Distribution and supply have been unbundled for eligible customers. Commercial quality standards have been divided in two groups: distribution standards and supply standards. The distribution standards apply to both eligible and non eligible customers. The supplier is allowed to change supply standards only for eligible customers, if they subscribe a specific contract.
THE NETHERLANDS	Due to the implementation of the liberalisation process agreements are made and put in codes within the sector on some elements of commercial quality. Before this there was nothing on commercial quality regulation.
NORWAY	Metering points shall be read upon change of provider and upon termination of electricity supply.
PORTUGAL	No. Quality of Service Code revision is a responsibility of the General Directorate of Energy. The code does not take in account these issues.
SPAIN	The commercial Quality Regulation is a responsibility of Ministry of Economy, but the regulator advise the Ministry of Economy. The actual regulation about commercial quality only refers to the distribution companies and obliges the distribution companies to comply with the standards established.

TABLE 4.2 WHICH COMMERCIAL QUALITY STANDARDS HAVE BEEN PUT ON DISTRIBUTORS AND WHICH ONES ON SUPPLIERS?	
AUSTRIA	There are no commercial quality standards defined.
FINLAND	Guarantees common to both Charters include Charter Arbitrator settlement guarantee, payment guarantee, appointment guarantee and refund guarantee.
FRANCE	There is no commercial quality regulation in France: the only rules are based either on contractual relations or on good behaviour principles.
GREAT BRITAIN	Network operators are responsible for the standards relating to the operation of the network. [The Network being the point the electricity leaves the transmission system (Transmission exit point) and arrives at the customers premises]. These include: • Responding to failure of mains fuse • Restoration of supply following a fault • Multiple interruptions • Estimating charges for connection • Notice of planned interruption to supply • Investigation of voltage complaints • Making and keeping appointments • Notifying customers of payments owed under the standards • Respond to customer letters within 10 working days Suppliers are responsible for standards relating to electricity the supply of electricity. These include: • Providing a meter • Meter disputes • Pre-payment meters • Estimate of charges for repositioning a meter • Charges and payments • Appointments • Payments/Billing
IRELAND	The Networks charter contains 12 guaranteed standards and the Supply Charter has 7 guaranteed services. The DSO charter includes (for example): • Network Repair Guarantee • Planned Supply Guarantee • Connection quotation Guarantee • Voltage Complaint Investigation The PES Charter includes (for example): • Reconnection Guarantee • Billing/metering accuracy Guarantee • Payment query guarantee
ITALY	The supply standards are three: - reading (at least 90% of LV customers with at least 1 meter reading per year), - maximum times to respond to queries on payments (at least 90% of LV customers queries responded within 15 days), - minimum number of bills with maximum exceeding in respect of estimation (at least 85% of bills made on actual reading must be not greater than 150% in respect of the average bill made on estimation for the same customer). Furthermore, the standard on written queries and claims apply to each supplier for its own claims. All the supply standards are OS.

continued

TABLE 4.2 (CONTINUE) WHICH COMMERCIAL QUALITY STANDARDS HAVE BEEN PUT ON DISTRIBUTORS AND WHICH ONES ON SUPPLIERS?	
THE NETHERLANDS	Specific commercial quality standards are in place for distributors on behalf of the captive customers (< 3x80 A connection). Specific commercial quality standards are in place for distributors on behalf of the eligible customers (> 3x80 A connection). The law gives also an obligation to report on commercial quality for suppliers of captive customers, but it is not worked out (yet) into standards.
NORWAY	Network owners are responsible for ensuring that energy consumption/energy flows at metering points is metered and read. Network companies are responsible for ensuring that invoicing of network services to households (billing) is in accordance with the provisions of these regulations.
PORTUGAL	There is not a legal distinction between supplier and distributor in the Quality of Service Code. All standards have been put on the distribution companies (supply business + wire business).
SPAIN	The commercial quality standards have been put on distribution companies only. The suppliers are not obliged to comply with these standards for eligible customers, but if they give wrong advice to the customers, then the customers can change supplier.

TABLE 4.3 HOW IS METERING REGULATION IN RESPECT OF COMMERCIAL QUALITY ASPECTS (READING, BILLING, METER INSTALLATION, METER VERIFICATION) DEFINED?

AUSTRIA	The Network operator is responsible for metering (reading, data aggregation, billing, installation, maintenance). He acts on basis of his general terms and conditions.
FINLAND	Some metering regulations are defined in the Electricity Market Degree. The distribution net operator is responsible for acquiring, owning and installing the measuring equipment needed in the retail sale and transmission of electricity, for inspecting and maintaining the measuring equipment, and for reporting measurement data to the parties to electricity trade. The net operator may offer the services as his own work, or he may purchase the services from outside partners, including other parties to electricity trade. The buyer of electricity is also entitled to acquire and own the measuring equipment and that meet the net operator's technical requirements.
FRANCE	There is no commercial quality regulation in France; the only rules are based either on contractual relations or on good behaviour principles. Metering is not open to competition.
GREAT BRITAIN	There are a number of standards on metering activities. These are covered by the supply standards.
IRELAND	Metering is not open to competition. Customer service obligations for metering are covered by the Metering Code and the Networks charter. The latter covers the more non-technical issues such as connection and meter maintenance. The Metering Code (which as of March 2003 was the subject to public consultation) sets minimum standards for measurement and recording of metered quantities for the purposes of electricity trading.
ITALY	There is not yet a complete regulation of metering. So far, metering standards are included in distribution standards, because the distributor is in charge of metering services, (excluding reading that is in the charge of suppliers). The situation of metering regulation could be changed soon.
THE NETHERLANDS	Metering in the Netherlands is a free market. Regulation is described in a 'code' and provides standards on how different parties of interest make use of the meter data. Commercial quality aspects aren't really integrated.
NORWAY	Reading: All metering points shall be read at least once per calendar year and refer to Mondays. Metering points belonging to households with expected annual electricity consumption higher than 8000 kWh shall be read every third, every second or every single month (periodic reading). Metering points with an expected annual energy out-take or energy input higher than 400 000 kWh shall be read each hour (hourly metering). Billing: Households with an expected annual electricity consumption in excess of 8,000 kWh shall be invoiced in arrears at least every third month on the basis of meter readings. The invoicing periods shall be of approximately equal duration. If obtaining meter readings entails unreasonable cost or inconvenience for the network owner, invoicing may be based on stipulated consumption and this shall be stated by the invoice.
PORTUGAL	There are guarantee standards and overall standards related with reading, billing and metering services.
SPAIN	There is not any specific regulation of metering. The distribution companies are in charge of metering services. Besides, the billing of the tariff supply and access to networks shall be carried out by the distribution companies on the basis of the reading of metering equipment installed for that purpose.

TABLE 4.4 IS THERE ANY REGULATION FOR SWITCHING SUPPLIER? IS THERE SOME STANDARD ABOUT SWITCHING?	
AUSTRIA	There is a market rule introduced by the regulator which defines the process for switching supplier (required data exchange, time limits, data formats, etc.).
FINLAND	At the moment according to the Electricity Market Act it is possible to change the supplier once without any costs. According to the draft of a proposed law it would be possible for the consumer to change the supplier once a year without any costs.
FRANCE	There is no regulation about switching supplier in France.
GREAT BRITAIN	Yes there is a process in place for switching supplier in GB. The Master Registration Agreement (MRA) is an electricity supply agreement that sets out the requirements for the change of supplier process. It is a multi-party agreement that all Ofgem licensed Suppliers and Distribution Business enter into, that governs the essential interactions between them when retail customers wish to change their supplier from one company to another. Electricity distribution companies and suppliers are obliged to sign and comply with the MRA under Standard Licence Condition 14 of the distribution licence and Standard Licence Condition 20 of the electricity supply licence. Version 1 of MRA was first signed in June 1998 on the opening of the GB electricity market to full competition.
IRELAND	Yes the Process is as follows: 1. New supplier sends Registration Form to Meter Registration Service Operator (MRSO), 2. MRSO validates registration request, 3. MRSO ensures that the customer's connection agreement is currently valid, 4. MRSO advise outgoing supplier, 5. Process normally 3 to 4 days for Eligible Customers, 6. MRSO arrange change-over meter reading for contract start date, 7. New supplier/old supplier advised of contract start date & change over reading, 8. MRSO begin the issue of meter data from the contract start date, 9. Outgoing supplier issues closing bill to customer, 10. New supplier begins invoicing customer. There is no fee for this process.
ITALY	Eligible customers have a right to sign off their current contract with a notice of 30 days. There is no standard for switching yet.
THE NETHERLANDS	Yes, there is a procedure in the Dutch 'netcode' that regulates switching and movement. This procedure describes which steps have to be taken by connected customers, suppliers, network operators and 'programme-responsibles' in order to process the administration of the switch.
NORWAY	Invoices shall provide a ready overview, be easily understood and shall contain a graphic comparison of the year's consumption in each settlement period with the same period of the previous year. Furthermore the invoice shall contain Enova SF's free phone number for advice on energy efficiency and on switching to other energy sources. Lastly the invoice shall contain clearly set out information on what particulars must be provided for the household to change to another electricity provider. Information needed to change supplier is metering point ID, supply commencement date, end user's name and postal address, and installation and invoicing address, if different from the end user's postal address.
PORTUGAL	All that is needed is a notification to the Offers System for switching supplier when the supplier is responsible for use of grid and use of system tariffs payment.
SPAIN	The term of tariff supply contracts and network access contracts shall be annual and shall be tacitly extended for the same periods of time. Notwithstanding the above, the consumer may finish the contract before that term, provided that proper notice is given to the distribution company at least five working days before the date on which the said consumer wishes to stop the supply and all without prejudice to the resulting economic conditions under the current tariff legislation in force. Currently (2003), there is a proposal in Spain for switching supplier whereby the customer will pay the costs incurred

TABLE 4.5 IS THE SUPPLIER THE ONLY CUSTOMER INTERFACE OR CAN THE ELIGIBLE CUSTOMER HAVE DIRECT RELATIONS WITH THE DISTRIBUTION NETWORK OPERATOR (FOR INSTANCE FOR CONNECTIONS)?

AUSTRIA	DSOs have direct contact to the customer in all cases concerning connections to the grid and metering. Hence the supplier is not the only customer interface.
FINLAND	The customer can have relations with both the supplier and the distribution network operator. In the matter of buying the electricity the consumer is usually in contact with the supplier and in the matter of delivery the customer interface is the distribution network operator.
FRANCE	Customers usually have direct relations with the distribution network operators. But regulation allows supplier to be the only customer interface if the customer has only one supplier.
GREAT BRITAIN	Customers can have direct relations with both the distributor and supplier. Customers may contact their supplier with supply related issues such as billing and metering. Customers may contact their distributor with distribution related issues such as loss of supply and requesting a new connection.
IRELAND	Customers usually have a direct relation with a network operator for their connection. However the customer is required to have a supplier before the connection agreement is enforced. Customers have relations with both the supplier and the DSO.
ITALY	Eligible customers have direct relations with distribution network operators for connection services. The supplier can offer to be the only customer interface.
THE NETHERLANDS	What is called the 'suppliers model' is the preferred option to customers, though not obligatory. Some customers like to interface with both the supplier as the network operator ('network model').
NORWAY	The customer can have direct contact with the network operator. Agreements containing terms and conditions for connection to and use of the network shall be entered into directly between the network owners and the individual customer.
PORTUGAL	In the liberalised market customers have relations with the distributor (customers have to sign the Access and Operation of Networks Agreement with the distributor) and with the supplier.
SPAIN	Eligible customers have direct relations with the distribution network operator for connections but the supplier can do it on behalf of them. The eligible consumers can choose if want to do this directly or with the supplier.

TABLE 4.6 IS THE BILLING UNIQUE TO THE ELIGIBLE CUSTOMER OR DO THEY RECEIVE SEPARATE BILLS FOR DISTRIBUTION AND SUPPLY?	
AUSTRIA	The customer can choose whether he wants separate bills for supply and distribution. Some suppliers offer to submit bills which include distribution and supply (not all suppliers offer this service). Customers who have not switched supplier yet get only one bill for distribution and supply. Distribution and supply costs have to be listed separately on the bill.
FINLAND	There is only one bill but the costs of supply and distribution are specified in the bill.
FRANCE	Eligible customers receive separate bills.
GREAT BRITAIN	Customers receive a single bill from their supplier which includes the costs of generation, transmission, distribution and supply. These costs are shown as an aggregated total and are not separated out.
IRELAND	Eligible customers receive one bill that includes their Networks and Supply charges. Suppliers sometimes vary the presentation of these charges.
ITALY	So far only customers with annual consumption > 9,000 MWh/year are eligible (some thousands); most of them have unique billing thanks to direct agreement between the supplier and the distributor. The number of eligible customers is now changing: in 2003 customers with more than 100 MWh/year will become eligible (more than 200,000 customers, even in low voltage). A final decision has not yet been made by the Regulatory Authority.
THE NETHERLANDS	One bill for the “suppliers model”, two for the “network model”.
NORWAY	The network owner can decide whether they would like to have joint invoicing with a supplier or not. If the network owner decides to do joint invoicing with one supplier, the company have to agree on the same deal with all other suppliers that would also like to participate in joint invoicing. In case of joint invoicing of network services and electrical energy, invoicing shall be in accordance with the provisions applying to the invoicing of the network services. Furthermore, the invoice shall identify who is the network company and who is the seller of electrical energy.
PORTUGAL	It depends on the customer choice. The Supplier can be responsible for the payment of the tariffs on behalf of the customer.
SPAIN	The contracting of access to the networks shall be formalised with distributors through the signing of a contract. Afterwards the eligible consumers can choose. If they choose to pay the bill for access to the network directly to the distributor, they will have two separated bills. If they want to pay it through the supplier, the supplier can bill the eligible consumers for supply and distribution together. The supplier can be responsible for the payment of the tariffs on behalf of the eligible consumers.

ANNEX 2 - DETAILED DATA ON CONTINUITY OF SUPPLY

TABLE 1 – INDICATORS - COMPARISON TABLE

COUNTRIES	FINLAND	FRANCE	GREAT BRITAIN	IRELAND	ITALY	THE NETHERLANDS	NORWAY	SPAIN	PORTUGAL
Unplanned interruptions (unnoticed)	Duration > 3', no notice in advance	Duration > 3', no notice in advance	Duration > 3', no notice in advance	Duration > 3', no notice in advance	Duration > 3', no notice in advance, included planned interruptions without notice.	The Dutch 'codes' don't differentiate over length of interruptions	Only interruptions originating in networks above 1kV are monitored	Duration > 3', no notice in advance	Only considered unplanned interruptions longer than 3'
Planned interruptions (noticed)	Duration > 3', notice in advance at least 1 day	No minimal duration	Duration > 3', no notice in advance at least 2 days	Duration > 3', notice in advance at least 1 day	Duration > 3', notice in advance at least 1 day	Not available.	Duration > 3', notice in advance at least 1 day	Duration > 3', notice in advance at least 1 day	Duration > 3', notice in advance at least 36 h
Nation-wide data	Not compulsory. Approx 80-90% of total MV-network length included	Whole continental country (Corsica and overseas areas are not included.	Mainland G. B. Only		99% of the customers are included				99,5% of the country is included.
Indicators	Statistic based on transformer districts.		All customers weighted the same; CMLs (customer minutes lost) are measured per 100 customers.		Minutes lost are weighted on number of LV customers; the same for number of interruptions per customer		Weighted on number of transformers (distribution and transmission)	Hours lost per consumer and number of interruptions per consumer	System Average Interruption Duration Index - SAIDI and System Average Interruption Frequency Index - SAIFI

TABLE 2 – RESPONSIBILITY ANALYSIS - COMPARISON TABLE

	FINLAND	FRANCE	GREAT BRITAIN	ITALY	IRELAND	THE NETHERLANDS	NORWAY	PORTUGAL	SPAIN
Acts of god	Thunder and lightning, snow and ice burden, fallen tree (due to snow burden), wind and storm, other weather related conditions, animals.	Transmission and Distribution System Operator don't really distinguish Act od God and 3rd parties damages. Exceptionals circumstaces are events of cause beyond control: acts of war, riots, plunders, sabotages, attacks or criminal attacks; damages as fires, explosions or fall of planes; natural disasters preview by laws; atmosferic phenomena (e.g. frost, sticking snow, storm) as soon as at the time of the same day and for the same cause, at least 100.000 cutomers supplied with the public network; strikes; outages for reasons of defence or public safety; sudden, fortuitous and simultaneous unavailability several generation stations.	DNO may make a claim to the regulator to have their performance adjusted for events they believe were exceptional and had a material and adverse impact on performance. The regulator then determines whether the event was exceptional and the extent of any adjustment taking into account whether the company to all reasonable steps to restore customers in an effective manner.	Acts of God are considered the following situations: intervention by the authorities, exceptional natural events for which the competent Authority has been declared the emergency state or natural events (for example earthquake), strikes, etc.	Weather external factors, major storms, unknown.	Weather influences		"Fortuitous or force majeure cases" considers the following situations: intervention by the authorities, war, public order, altercation, fire, earthquake, flooding, gale, direct lightning strikes, misdeeds, duly proven third party intervention, strikes, as well as any other comparable cases of an unforeseeable or compelling nature.	For example: the atmospheric phenomena that are deemed usual or normal in each geographical area in accordance with the statistical data available.
3rd parties damages:	Careless timbering, Digging, other action by 3rd party, disorderly conduct.		Companies are not required to report interruptions caused by third-party damage as a separate category.	3rd parties damages: Damages to networks by third parties, interruptions due to customers, thefts, fires, etc.	Damage to networks by 3rd parties, such as cable dig-ins etc.	Digging activities		Not defined.	These are due to the action of somebody outside of the distribution company. For example: acts of vandalism, digger.

TABLE 3.1 UNPLANNED INTERRUPTIONS
MINUTES LOST PER CUSTOMER PER YEAR (1999 - 2001)

	1999	2000	2001
Finland (1)	188	161	199
France	55	46	59
Great Britain	69.76	62.7	77.8
Italy	228.25	209.2	171.09
Ireland	254	256	197
The Netherlands	26	27	34
Norway	186	234	234
Portugal	n.a.	n.a.	530.74
Spain	n.a.	n.a.	179.4

n. a. = not available

TABLE 3.2 UNPLANNED INTERRUPTIONS
NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (1999 - 2001)

	1999	2000	2001
Finland (1)	3.3	4.2	4.69
France	1.22	1.2	1.2
Great Britain	0.729	0.775	0.806
Italy	4.21	3.81	3.46
Ireland	1.13	1.54	1.35
The Netherlands	0.44	0.41	0.67
Norway	2.5	2.7	3
Portugal	n.a.	n.a.	7.51
Spain	n.a.	n.a.	3.3

n. a. = not available

(1) To allow fair comparison with previous years, continuity data for Finland in year 2001 presented in these tables are net of estimated effects of two very serious and rare storms (Pyry and Janika) that occurred in Finland in year 2001.

TABLE 3.3 UNPLANNED INTERRUPTIONS

DENSITY LEVEL ANALYSIS - MINUTES LOST PER CUSTOMER PER YEAR (1999 - 2001)

	Urban	Semi-urban	Rural
Finland (1)	73	140	509
France	26	53	93
Great Britain	n.a.	n.a.	n.a.
Italy	79.63	188.39	249.92
Ireland	118	n.a.	233
The Netherlands	n.a.	n.a.	n.a.
Norway	n.a.	n.a.	n.a.
Portugal	154.98	256.19	637.53
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 3.4 UNPLANNED INTERRUPTIONS

DENSITY LEVEL ANALYSIS - NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (1999 - 2001)

	Urban	Semi-urban	Rural
Finland (1)	1.2	2.3	7.6
France	0.99	1.28	1.34
Great Britain	n.a.	n.a.	n.a.
Italy	1.93	3.5	5.18
Ireland	0.88	n.a.	1.55
The Netherlands	n.a.	n.a.	n.a.
Norway	n.a.	n.a.	n.a.
Portugal	2.53	4.41	8.43
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 3.5 UNPLANNED INTERRUPTIONS

RESPONSIBILITY ANALYSIS - MINUTES LOST PER CUSTOMER PER YEAR (1999 - 2001)

	Acts of God	3rd parties damages	Any other causes
Finland (2)	347	74	35
France	14	9	36
Great Britain	n.a.	n.a.	n.a.
Italy	11.53	37.52	122.04
Ireland	116.01	14.9	66
The Netherlands	0.9	8.1	25.1
Norway	n.a.	n.a.	n.a.
Portugal	117.88	n.a.	412.86
Spain	40.2	26.4	112.8

n. a. = not available

TABLE 3.6 UNPLANNED INTERRUPTIONS

RESPONSIBILITY ANALYSIS - NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (1999 - 2001)

	Acts of God	3rd parties damages	Any other causes
Finland (2)	4.25	0.91	1.42
France	0.02	0.3	0.88
Great Britain	n.a.	n.a.	n.a.
Italy	0.11	0.63	2.72
Ireland	n.a.	n.a.	n.a.
The Netherlands	0.039	0.112	0.518
Norway	n.a.	n.a.	n.a.
Portugal	1.61	n.a.	n.a.
Spain	0.37	0.49	2.44

n. a. = not available

(2) Continuity data for Finland in year 2001 presented in these tables include all interruptions, even due two very serious and rare storms (Pyry and Janika) that occurred in Finland in year 2001.

TABLE 3.7 UNPLANNED INTERRUPTIONS

VOLTAGE LEVEL ANALYSIS - MINUTES LOST PER CUSTOMER PER YEAR (2001)

	Generation, transmission & HV networks	Distribution MV networks	Distribution LV networks
Finland (2)	n.a.	456	n.a.
France	3	48	8
Great Britain	5.5	57.47	14.17
Italy	10.2	139.53	21.3
Ireland	n.a.	153	44
The Netherlands	8.7	20.9	4.6
Norway	29	205	n.a.
Portugal	n.a.	n.a.	n.a.
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 3.8 UNPLANNED INTERRUPTIONS

VOLTAGE LEVEL ANALYSIS - NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (2001)

	Generation, transmission & HV networks	Distribution MV networks	Distribution LV networks
Finland (2)	n.a.	6.55	n.a.
France	n.a.	1.02	0.03
Great Britain	0.12	0.56	0.06
Italy	0.32	2.97	0.16
Ireland	n.a.	1.1	0.25
The Netherlands	0.416	0.229	0.024
Norway	0.5	2.5	n.a.
Portugal	n.a.	n.a.	n.a.
Spain	n.a.	n.a.	n.a.

n. a. = not available

FIG. A – UNPLANNED (UNNOTICED) INTERRUPTIONS - RESPONSIBILITY ANALYSIS
MINUTES LOST PER CUSTOMER PER YEAR (2001)

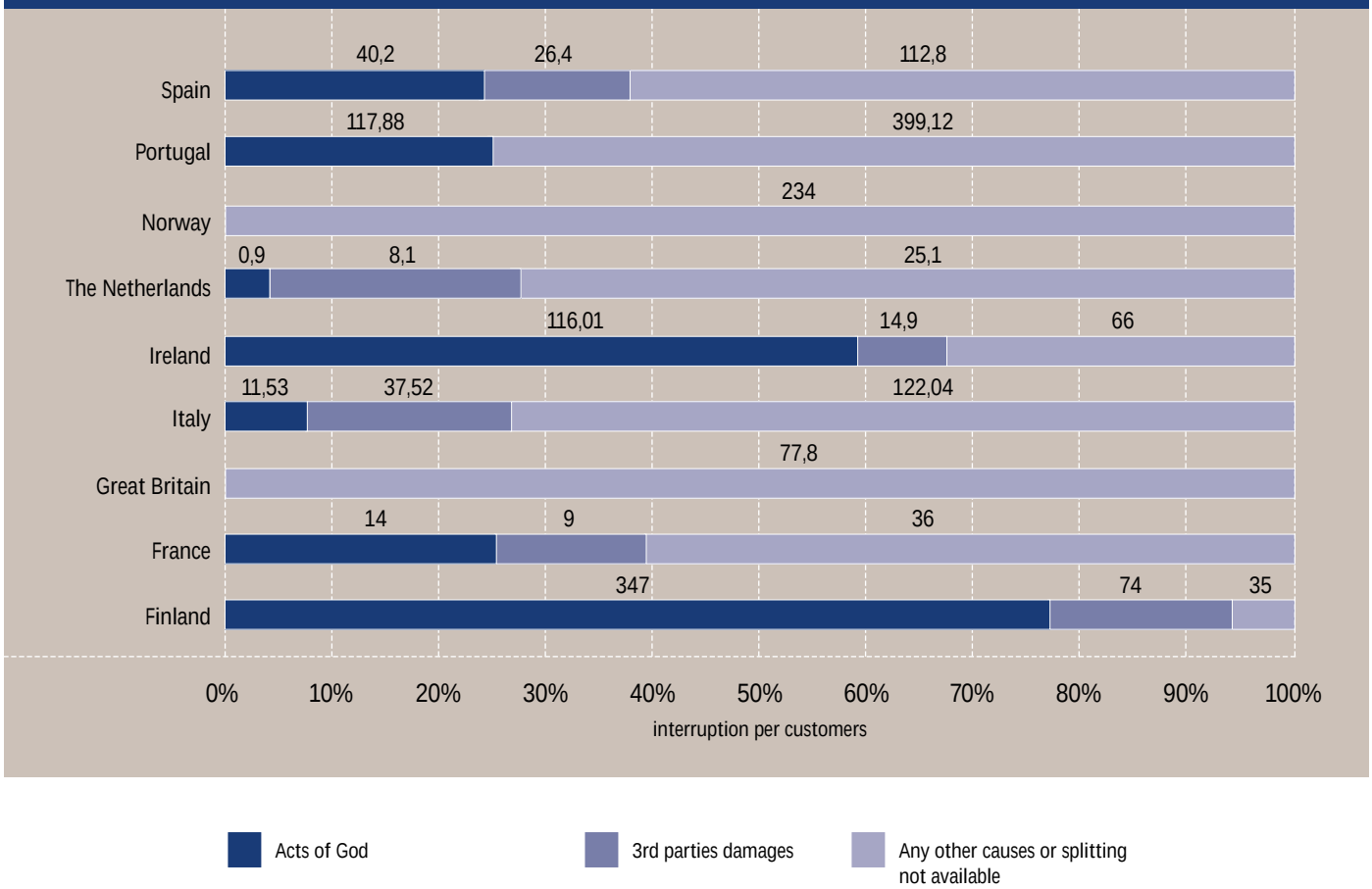


FIG. B – UNPLANNED (UNNOTICED) INTERRUPTIONS - RESPONSIBILITY ANALYSIS
INTERRUPTIONS PER CUSTOMER PER YEAR (2001)

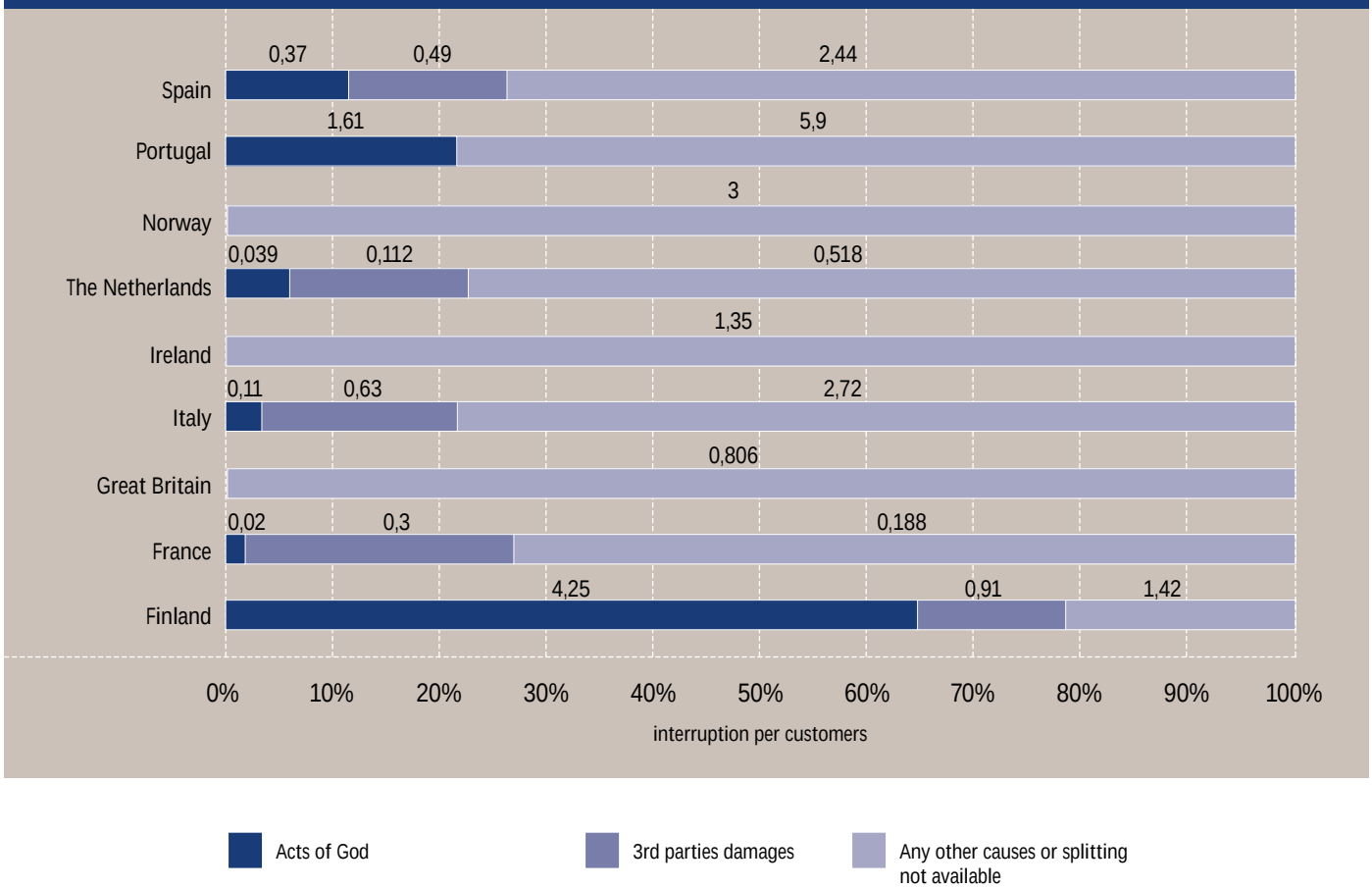


TABLE 3.9 – UNPLANNED REGIONAL DATA (2001)

COUNTRY	REGIONS	MINUTES LOST PER CUSTUMER	NUMBER OF INTERRUPT. PER CUST.	DISTRIBUTED ENERGY AT MV & LV (TWH)	LENGTH OF MV CIRCUITS (KM)	NUMBER OF LV USERS (MILLIONS)	AREA (KM²)
GB	London Power Networks	43.00	0.40	24.193	9,073	2.07	665
NOR	Oslo (County in the south-east of Norway)	47.00	0.70	9.2	3,552	0.507	454
GB	Manweb	55.00	0.53	14.497	19,421	1.44	12,200
GB	Yorkshire Electricity Distribution	56.00	0.70	22.274	20,509	2.07	10,700
E	País Vasco	56.40	0.92	n.a.	11,078	1.049	7,234
E	Navarra	59.40	1.16	n.a.	15,266	0.283	10,391
GB	NORWEB (Now United Utilities)	60.00	0.54	23.575	19,239	2.26	12,500
I	Friuli - Venezia Giulia	62.74	1.66	5.23	7,187	0.7	7,844
GB	Eastern Electricity	66.00	0.69	32.7	36,354	3.35	20,300
E	La Rioja	66.00	1.5	n.a.	1,264	0.178	5,045
GB	Southern Electric Power Distribution	69.00	0.74	29.37	27,500	2.69	16,900
GB	Western Power Distribution (South West)	70.00	0.87	14.245	17,179	0.99	14,400
GB	SEEBOARD Energy	75.00	0.89	19.054	16,555	2.15	8,200
FIN	Lappland (northern part of Finland)	81.00	2.20	n.a.	10,937	n.a.	93,004
I	Valle D'Aosta	84.13	1.80	0.55	1,268	0.11	3,264
I	Liguria	89.08	2.46	4.89	6,565	1.21	5,420
I	Lombardia	89.86	1.79	44.22	35,446	5.07	23,872
I	Umbria	90.61	2.26	2.88	7,622	0.48	8,456
E	Asturias	91.20	1.37	n.a.	9,015	0.589	10,604
E	Madrid	92.40	2.66	n.a.	33,641	2.531	8,028
I	Marche	102.17	2.46	5.26	10,289	0.82	9,694
GB	Northern Electric Distribution Limited	110.00	0.98	14.089	20,098	1.50	14,400
GB	Scottish Hydro-Electric Power Distribution	111.00	1.32	n.a.	25,239	0.66	54,390
GB	East Midlands Electricity Distribution	112.00	0.91	27.093	26,736	2.42	16,000
E	Cantabria	112.20	2.37	n.a.	6,551	0.311	5,321
E	Aragón	112.20	2.5	n.a.	9,214	0.737	47,720
I	Trentino Alto Adige	113.25	3.36	2.47	5,362	0.33	13,607
E	Castilla-León	115.20	2.42	n.a.	20,893	0.165	94,223
I	Veneto	115.32	2.69	21.38	23,529	2.49	18,364
I	Emilia-Romagna	115.34	2.09	20.06	27,752	2.51	22,123
I	Piemonte	118.81	2.58	17.71	27,096	2.72	25,399

continued

TABLE 3.9 – (CONTINUE) UNPLANNED REGIONAL DATA (2001)

COUNTRY	REGIONS	MINUTES LOST PER CUSTUMER	NUMBER OF INTERRUPT. PER CUST.	DISTRIBUTED ENERGY AT MV & LV (TWH)	LENGTH OF MV CIRCUITS (KM)	NUMBER OF LV USERS (MILLIONS)	AREA (KM^2)
I	Toscana	119.51	3.30	14.58	23,982	2.19	22,993
GB	Western Power Distribution (South Wales)	123.00	1.58	9.357	23,486	1.36	14,400
IRL	Dublin	133	0.93	n.a.	3,911	0.463853	n.a.
UK	GPU Power Networks (Now Aquila)	143.00	1.48	26.073	26,222	2.26	13,300
I	Lazio	143.02	3.44	17.12	26,766	3.11	17,227
E	C. Valenciana	145.80	3.78	n.a.	26,742	2.603	23,255
GB	SP Distribution	152.00	0.92	n.a.	32,059	1.91	22,950
I	Molise	161.88	4.02	1.04	3,480	0.2	4,438
E	Canarias	171.60	4.4	n.a.	8,827	0.825	7,242
E	Murcia	176.40	3.84	n.a.	4,344	0.597	11,313
I	Abruzzo	180.50	3.39	4.49	9,115	0.78	10,795
E	Cast-La Mancha	186.60	4.08	n.a.	27,081	1.054	79.463
E	Extremadura	202.80	4.54	n.a.	6,777	0.555	41,634
I	Mid-western	205	1.52	n.a.	25,478	0.368593	n.a.
E	Andalucía	215.40	3.78	n.a.	38,686	3.621	87,597
I	Northern	229	1.65	n.a.	26,538	0.362114	n.a.
E	Cataluña	229.80	3.54	n.a.	55,466	3.705	32,114
I	Campania	235.91	4.92	12.85	21,647	2.63	13,595
IRL	Southern	238	1.40	n.a.	24,410	0.391795	n.a.
P	Grande Porto	252.83	2.92	n.a.	9,181	0.592	735
I	Puglia	258.31	3.62	9.41	24,889	2.2	19,362
NOR	Akershus (County in the south-east of Norway)	270.00	2.40	7.1	5,677	0.47	4,916
P	Península de Setúbal	271.78	6.11	n.a.	5,200	0.407	1,519
P	Grande Lisboa	276.8	3.42	n.a.	7,212	0.82	567
P	Algarve	284.4	5.7	n.a.	8,871	0.318	4,990
FIN	Coast	307	2.60	n.a.	37,008	n.a.	n.a.
E	Galicia	310.20	5.12	n.a.	29,597	1.444	29,574
I	Sicilia	311.48	5.80	11.7	33,216	2.82	25,707
NOR	Finnmark (County in the north of Norway)	327.00	3.50	1.4	3,488	0.074	48,649
I	Calabria	327.05	8.19	4.18	15,219	1.19	15,080
P	Beira interior	378.17	8.09	n.a.	8,234	0.269	11,463

continued

TABLE 3.9 – (CONTINUE) UNPLANNED REGIONAL DATA (2001)

COUNTRY	REGIONS	MINUTES LOST PER CUSTUMER	NUMBER OF INTERRUPT. PER CUST.	DISTRIBUTED ENERGY AT MV & LV (TWH)	LENGTH OF MV CIRCUITS (KM)	NUMBER OF LV USERS (MILLIONS)	AREA (KM²)
I	Basilicata	435.03	4.91	1.82	8,831	0.34	9,992
P	Trás-os-Montes	440.29	8.34	n.a.	8,980	0.27	11,383
I	Sardegna	486.32	7.37	4.75	14,230	0.94	24,090
FIN	Inland	506	9.30	n.a.	59,226	n.a.	n.a.
P	Ave-Sousa	507.2	8.18	n.a.	8,124	0.392	3,155
E	Baleares	576.00	4.19	n.a.	8,122	0.533	4,992
P	Alentejo	667.91	10.24	n.a.	7,827	0.227	21,159
P	Minho	685.64	7.36	n.a.	10,491	0.373	3,887
P	Oeste	699.49	9.22	n.a.	3,972	0.347	1,938
P	Litoral Centro	721.21	9.34	n.a.	7,692	0.299	3,833
P	Coimbra	782.3	10.78	n.a.	8,685	0.349	6,121
P	Vale do Tejo	921.19	14.33	n.a.	7,915	0.278	11,987
P	Beira Litoral	1001.24	11.65	n.a.	11,922	0.452	6,072

TABLE 4.1 PLANNED INTERRUPTIONS

MINUTES LOST PER CUSTOMER PER YEAR (1999 - 2001)

	1999	2000	2001
Finland	103	38	32
France	4	6	6
Italy	n.a.	126.57	127.4
Great Britain	10.95	8.1	8.12
Ireland	170	172	188
The Netherlands	n.a.	n.a.	n.a.
Norway	109	106	70
Portugal	n.a.	n.a.	57.37
Spain	n.a.	n.a.	36.6

n. a. = not available

TABLE 4.2 PLANNED INTERRUPTIONS

NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (1999 - 2001)

	1999	2000	2001
Finland	1.8	1.3	0.6
France	0.03	0.04	0.04
Italy	n.a.	0.83	0.79
Great Britain	0.05	0.04	0.04
Ireland	0.46	0.44	0.51
The Netherlands	n.a.	n.a.	n.a.
Norway	0.64	0.63	0.52
Portugal	n.a.	n.a.	0.32
Spain	n.a.	n.a.	0.42

n. a. = not available

TABLE 4.3 PLANNED INTERRUPTIONS

DENSITY LEVEL ANALYSIS - MINUTES LOST PER CUSTOMER PER YEAR (2001)

	Urban	Semi-urban	Rural
Finland	34	7	14
Great Britain	n.a.	n.a.	n.a.
Italy	28.94	144.19	215.84
Ireland	23	n.a.	261
The Netherlands	n.a.	n.a.	n.a.
Norway	n.a.	n.a.	n.a.
Portugal	n.a.	n.a.	n.a.
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 4.4 PLANNED INTERRUPTIONS

DENSITY LEVEL ANALYSIS - NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (2001)

	Urban	Semi-urban	Rural
Finland	0.1	0.1	0.6
Great Britain	n.a.	n.a.	n.a.
Italy	0.29	0.84	1.36
Ireland	0.06	n.a.	0.72
The Netherlands	n.a.	n.a.	n.a.
Norway	n.a.	n.a.	n.a.
Portugal	n.a.	n.a.	n.a.
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 4.5 PLANNED INTERRUPTIONS

RESPONSIBILITY ANALYSIS - MINUTES LOST PER CUSTOMER PER YEAR (2001)

	Acts of God	3rd parties damages	utility responsibility
Finland	n.a.	n.a.	n.a.
France	n.a.	n.a.	6
Italy	0.1	1.5	125.75
Ireland	n.a.	n.a.	188
The Netherlands	n.a.	n.a.	n.a.
Norway	n.a.	n.a.	n.a.
Portugal	n.a.	n.a.	n.a.
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 4.6 PLANNED INTERRUPTIONS

DENSITY LEVEL ANALYSIS - NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (2001)

	Acts of God	3rd parties damages	utility responsibility
Finland	n.a.	n.a.	n.a.
France	n.a.	n.a.	0.04
Italy	n.a.	0.01	0.78
Ireland	n.a.	n.a.	0.51
The Netherlands	n.a.	n.a.	n.a.
Norway	n.a.	n.a.	n.a.
Portugal	n.a.	n.a.	n.a.
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 4.7 PLANNED INTERRUPTIONS

VOLTAGE LEVEL ANALYSIS - MINUTES LOST PER CUSTOMER PER YEAR (2001)

	Generation, transmission & HV networks	Distribution MV networks	Distribution LV networks
Finland	n.a.	32	n.a.
Great Britain	n.a.	n.a.	n.a.
Italy	0.07	110.99	16.33
Ireland	n.a.	179.6	8.4
The Netherlands	n.a.	n.a.	n.a.
Norway	8	62	n.a.
Portugal	n.a.	n.a.	57.37
Spain	n.a.	n.a.	n.a.

n. a. = not available

TABLE 4.8 PLANNED INTERRUPTIONS

VOLTAGE LEVEL ANALYSIS - NUMBER OF INTERRUPTIONS PER CUSTOMER PER YEAR (2001)

	Generation, transmission & HV networks	Distribution MV networks	Distribution LV networks
Finland	n.a.	0.6	n.a.
Great Britain	n.a.	n.a.	n.a.
Italy	n.a.	0.63	0.16
Ireland	n.a.	0.49	0.02
The Netherlands	n.a.	n.a.	n.a.
Norway	0.05	0.47	n.a.
Portugal	n.a.	n.a.	0.32
Spain	n.a.	n.a.	n.a.

n. a. = not available

5.1 CASE EXAMPLE - ITALY

Quality can be measured only by companies. The regulatory authority determines the measurement rules and checks measurement procedures by means of sample inspections. Quality certification according to the Iso 9000 scheme is a useful device with which to introduce quality management procedures and systems, but it may not be enough *per se* to ensure the regular assessment of quality indicators.

Because the data on continuity levels are provided by utilities, the Italian Regulatory Authority (AEEG) checks that interruptions are recorded in a complete and satisfactory manner, according to the measurement rules defined by AEEG itself.

AEEG recognizes that some interruption events are out of the control of distribution utilities. For this reason, a system has been developed to separate responsibilities of the distribution utilities:

- as regards measurement of continuity, the distributors can label interruptions as attributable to force majeure (acts of God) or to users' or third parties' acts; in this case the distributor must provide documentation of the cause of interruption;
- as regards regulation, interruptions due to acts of God or to users' or third parties' acts are excluded by the system of penalties and incentives; furthermore, a 2-year rolling average has been adopted to avoid meteorological volatility of continuity data and a +/- 5% deadband is assumed to sterilise little variations;
- as regards control, during the audits special attentions is devoted by the regulator to verify the documentation of interruptions that have been excluded by the distributor labelled as "force majeure" or "acts of users or third parties"; a correctness index has been devised to check this aspect and, should the distributor abuse of the two clauses that exclude interruptions from economic regulation, a presumed value of continuity would be calculated by the regulator and sanction can apply.

The whole Italian territory has been divided in about 300 district in order to regulate continuity separately in each district. Audits are carried out by internal personnel on a randomly selected sample of districts. In each sampled district AEEG inspectors examine a sample of interruptions to determine whether they have been exactly recorded, both automatically and manually, and that continuity indicators have been adequately calculated, in compliance with measurement rules defined by the Authority (see attached synthesis).

Each interruption must be recorded both automatically (by the SCADA system) and manually (for restoring operations). For transient and short interruptions a 2 years delay has been allowed to implement the automatic recording system. The automatic recording of interruptions on HV-MV networks is a specific requirement put on distribution networks operators by the AEEG. To ensure the trackability of data provided by the utilities, high and medium voltage lines shall be subject

to a remote control system able to detect and record every interruption event occurring at these voltage levels. A similar requirement has not been applied to the low voltage network, because of the high costs involved, and because interruptions originating in the low voltage network have an average effect on the continuity indicators, which is about 10% of the total.

During the audits, particular attention is devoted to verify that:

- All the interruption events are recorded and that manual recording is consistent with automatic recording via SCADA system (accuracy);
- The continuity indicator deriving from the sampled interruptions is sufficiently close to the declared indicator for the same interruptions (precision);
- The causes of the interruptions are correctly attributed and documented, especially for the clauses of measurement rule that allow to exclude interruptions from regulation when they are caused by acts of God or by users and third party damages (correctness).

The AEEG has defined three indexes to evaluate these controls, based on the figures referred to the interruptions sampled during the audit:

- An accuracy index, which measures whether all events have been recorded; a conventional scale has been defined to measure accuracy in recording interruptions, that fixes the weight of the worst case (interruption not recorded) equal to 1, and therefore the weights of some other cases, less severe, between 0.5 and 0.01. Should all the interruptions sampled result non recorded, the accuracy index assumes value equal to 0; on the contrary, in the case all the interruption sampled are accurately recorded, the index is equal to 100%.
- A precision index, that measures the approximation of customer minutes lost; the index compares the continuity indicator deriving from the sampled interruptions with the declared continuity indicator for the same interruptions. The index can assume positive or negative value because errors in customer minutes lost can be compensated; if the indicator is equal to 0, it means that the precision of declared indicator is absolute.
- A correctness index, which refers only to interruptions excluded from the regulation because they have been labelled by the utility as caused by acts of God or by users and third party actions. The correctness index aim to verify that documentation for excluding these interruptions from regulation is fair enough to avoid abuse.

An audit may last of one or two days and is conducted in site at the SCADA operating centre (generally, one SCADA operating centre is related to more than one district). The interruptions audited are both randomly sampled and strategically selected. Generally, about 10% of the total number of HV-MV interruption events is verified during an audit. The audit is concluded with a report that can be obtained by the relevant utility on request.

Audits results are used to validate or not data provided by the distributors. The following thresholds have been set:

- At least 90% of accuracy is required;
- A maximum +/- 3% of approximation is allowed;
- The correctness index shall assume values that assure that the incorrectly excluded interruptions do not overpass the 3% (in customer minutes lost) of declared indicator used for regulation.

Should one of the three conditions be not respected, the continuity data declared by the distributor are considered not valid, and are substituted with a "presumed value" calculated by the AEEG on the base of the audit results. In particular, the presumed value is equal to:

$$A_{pres} = \frac{A+Bx(1-IC)}{(1-IP)}$$

where:

- A_{pres} is the presumed value for the regulated indicator (CML, net of excluded interruptions);
- A is the declared value for the regulated indicator;
- B is the declared value of CML referred to excluded interruptions;
- IC is the index of correctness;
- IP is the index of precision.

As a sanction, when the presumed value must be calculated, the distribution utility can not gain in the relevant district, neither when the actual presumed value is better than the relevant standard. Furthermore, if the data submitted are false, AEEG is empowered by law to impose a financial sanction upon the distribution utilities. This has actually happened in May 2001 for Enel, after a proceeding that has recognised Enel submitted false data for continuity levels in 3 Southern regions (about 6 millions LV users).

RECORDING AND MEASUREMENT OF THE INTERRUPTIONS OF SUPPLY.

Synthesis of rule n. 128/99 of the Italian Regulatory Authority for Electricity and Gas

Types of interruptions

Interruptions: actual voltage < 1% of the nominal voltage

- Interruptions with notice (generally 1 day in advance)
- Interruptions without notice:
  - long (duration > 3 minutes[1])
  - short (duration < 3 minutes and > 1 second)
  - transient (duration < 1 second)

1 Consistent with technical standard EN 50160

Classification of interruptions' causes

(*applicable to interruptions without notice, both long and short*)

- force majeure:
  - acts of public authorities
  - natural disasters
  - severe weather conditions only if design requirements are overpassed
- external causes:
  - damages by third parties
  - interruptions caused by users
  - loss of supply from national transmission grid
  - loss of supply from other distributors
- causes attributable to the distributor
  - all other causes not indicated in "force majeure" or external causes

Classification of interruptions' origins

(*applicable to all interruptions*)

- national transmission grid
- HV network (> 35 kV)
- MV network (> 1 kV and < 35 kV; includes also HV/MV transformers if the fault does not cause the interruption in the HV line)
- LV network (< 1 kV; includes also MV/LV transformers if the fault does not cause the interruption in the MV line)

Classifications of areas

(*applicable to all MV and LV users*)

- Urban ("high density") areas: territory of municipalities with more than 50,000 inhabitants
- Sub-urban ("medium density") areas: territory of municipalities with more than 5,000 and less than 50,000 inhabitants
- Rural ("low density") areas: territory of municipalities with less than 5,000 inhabitants
- Only for municipalities with more than 50,000 inhab., providers can ask the Authority for a reclassification of rural and sparse areas inside the same municipality (about 90 cities partly reclassified)

Required devices for automatic recording of interruptions without notice

- Remote control device on every HV and MV line
- Alternatively, an appropriate recorder on every HV and MV line
- Distributor may ask the Authority for a reasonable time to install devices (3 years for remote control device, 1 year for quality recorders)

- No automatic recording is required on the LV network; interruption originated on the LV network are recorded only through the reports of the operators

Required records of interruptions

For each type of interruption, the distributor must record the following items:

- Interruptions with notice
  - origin of the interruption
  - notice procedure
  - start (day-hour-minute)
  - list of HV users affected and duration for each HV user affected
  - list of MV users affected per area and duration for each MV user affected
  - number of LV users affected per area (estimate; see below)
  - duration for each LV group of users affected by the same duration of interruption, per area
  - finish (day-hour-minute for the last LV user affected)
- Interruptions without notice, long (duration > 3min):
  - origin of the interruption
  - cause of the interruption
  - start (day-hour-minute)
  - list of HV users affected and duration for each HV user affected
  - list of MV users affected per area and duration for each MV user affected
  - number of LV users affected (estimate; see below)
  - duration for each LV group of users affected by the same duration of interruption
  - finish (day-hour-minute for the last LV user affected)
- Interruptions without notice, short (duration < 3min and > 1sec):
  - origin of the interruption
  - cause of the interruption
  - start (day-hour-minute)
  - list of HV users affected
  - list of MV users affected per area (estimate; see below)
  - number of LV users affected per area (see below)
  - finish (day-hour-minute for the last LV user affected)
- Interruptions without notice, transient (duration <1sec):
  - origin of the interruption
  - start (day-hour-minute)
  - list of HV users affected
  - list of MV users affected per area (estimate; see below)
  - finish (day-hour-minute for the last LV user affected)

Estimate of the number of LV users affected

For interruption with or without notice, long:

- Interruptions with origin in the HV or MV network
  - Number of LV users affected = number of MV/LV transformer affected multiplied by the ratio LV users per MV/LV transformer (calculated at municipality level, taking account of different areas)
- Interruptions with origin in the LV network
  - Number of LV users affected = number of LV lines affected multiplied by the ratio LV users per LV line (calculated at municipality level, taking account of different areas)

Estimate of the number of MV users affected

For interruption without notice short or transient:

- Standard network configuration

Continuity overall indicators for LV and MV users

For both interruptions with and without notice, long

- Average number of interruptions per user (weighted on the number of users)
  - Separately per MV and LV users
  - Separately per provinces
  - Separately per origins and per causes
  - Separately per areas
- Cumulative duration of interruptions per user (weighted on the number of users)
  - Separately per MV and LV users
  - Separately per provinces
  - Separately per origins and per causes
  - Separately per areas

For interruptions without notice, both short and transient

- Average number of interruptions per user (weighted on the number of users)
  - Separately per MV and LV users
  - Separately per provinces
  - Separately per origins and, only for short interruptions, per causes
  - Separately per areas

Continuity individual indicators for MV and HV users

- Number of interruptions for each single user
- Duration of every interruptions for each single user (only for interruptions with or without notice, long)

Audits

- Distributors provide Authority the continuity indicators and must assure the traceability of every interruption record used in the calculation
- Authority audits on field the data provided by distributors
- Audits take place sampling some interruption events and verifying:
  - the actual implementation of procedures for recording interruptions
  - the completeness of required documentation for each interruption
  - the right calculation of the continuity indicators
- In case of mistakes, distributors are prosecuted and can be sentenced to pay a fine

5.2 CASE EXAMPLE - GREAT BRITAIN

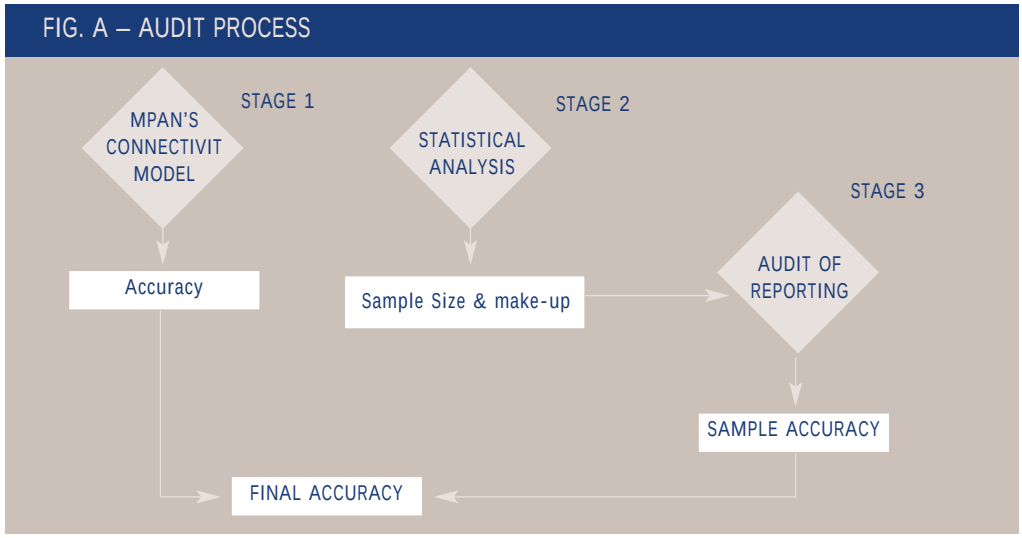
General reporting requirements

Ofgem has introduced standard definitions and guidance and minimum levels of accuracy that Distribution Network Operators (DNOs) must meet for reporting quality of supply. These are set out in the Regulatory Instructions and Guidance (RIGs), a document first published by Ofgem in February 2001. The number and duration of interruptions must be measured to a level of accuracy of at least 90 per cent at low voltage and at least 95 per cent for the overall network. (This includes higher and low voltage interruptions). In order for Ofgem to be satisfied that the DNOs are complying with the definitions and accuracy levels it has introduced an annual audit of measurement systems and incident reporting.

Audit process

Ofgem, together with its consortium of audit consultants (Mott MacDonald, British Power International and ERA Technology) have developed a framework for auditing quality of service information provided by the DNOs. The audits are carried out by Ofgem's consultants and involve a three-stage process illustrated in Figure A below.

FIG. A – AUDIT PROCESS



Stage 1: Audit of measurement systems

The first stage of the audit process focuses on assessing the accuracy of DNOs' measurement systems by looking at the way in which DNOs have counted customers in their connectivity models and the underlying assumptions that DNOs have used, for example on linking customer information to their network models.

Stage 2: Statistical analysis

DNOs experience on average 2,000 to 3,000 incidents a year on their higher voltage systems and 10,000 to 15,000 incidents a year on their low voltage systems. The second stage of the audit involves using statistical sampling techniques to determine a representative sample of incidents to use in the final stage of the audit.

The first step in the statistical analysis is to determine the statistical distribution that best describes the population of incidents. Once this has been established, the sample size is determined for a given confidence level. Further analysis of the data is then undertaken to stratify the sample. This is necessary to help ensure that the sample chosen for each DNO is representative and takes into consideration factors outside the DNO's control that may have a significant impact on the accuracy of reporting.

Stage 3: Audit of incident reporting

Stage 3 of the audit involves a visit to each of the companies and a detailed examination of each of the incidents in the sample. This involves an assessment of whether:

- the number of customers affected by each incident as reported by the DNO corresponds to the numbers that the DNOs' latest measurement systems identify;
- each incident has been captured by the measurement systems by looking at customer and incident reports and by checking that logged network events relate to the relevant incident reports;
- and incident start times, restoration stages, new incidents and re-interruptions are logged correctly, and in accordance with the regulatory definitions.

At the end of this stage, the accuracy of the samples is calculated and combined with the accuracy resulting from Stage 1 to find the final accuracy of reporting[2]. The methodology for combining the accuracy levels to determine the final accuracy is still under development and needs to be finalised prior to completion of the 2003 audits.

A more detailed explanation of the audit process and the audit results for the 2001/2 reporting year can be found on Ofgem's website at:

http://www.ofgem.gov.uk/temp/ofgem/cache/cmsattach/2249_dno.pdf

2 As most DNOs were in the process of introducing measurement systems during 2001/02 the stage 1 and stage 3 accuracies have not been combined for that year. This is because some of the data will have been reported using the old measurement systems and therefore stage 3 of the audit will have picked up inaccuracies in the old measurement systems as well as other reporting errors.

5.3 CASE EXAMPLE - PORTUGAL

According to the Quality of Service Code distributors are obliged to collect and register all the information necessary to verify the Code fulfilment.

Each quarter distributors must send to the regulator information about continuity and voltage quality indicators defined in the Quality of Service Code.

Information about quality of service should be maintained available during, at least, a period of 5 years.

Distributors are obliged to perform internal audits covering the following fields:

- Information collection systems
- Information register procedures
- Methods and criteria utilised to calculate quality of service indicators.

Internal audits should be performed by distributors with a maximum interval time of two years. Distributor must send the results of internal audits to the regulator with a maximum delay of one month after their conclusion.

5.4 CASE EXAMPLE - NORWAY

Norwegian Water Resources and Energy Directorate (NVE) has set the rules for the mandatory reporting of interruption data and cost of energy not supplied in the secondary legislastion to the energy act. In this legislation there is a reference to the FASIT-requirement specification (software specification). FASIT is the fault and interruption collection tool owned by The Electricity Association (EBL). FASIT is used to record information on faults and disconnections at all network levels in the power system. This tool can register disconnections in the network, i.e. the duration of the disconnection, disconnection costs and non-delivered energy at every individual delivery point[3] in the network. Interruption statistics for NVE and fault statistics can be generated easily. The FASIT-specification is reviewed every year by a working group with members from NVE, EBL, Statnett (the transmission system operator), Sintef Energy Research (Sintef) and 3 network companies. All the network companies in Norway have to use FASIT-software that fulfils the requirements in the specifications for the given year of reporting data. Several software companies have developed FASIT-software. Each year the software is revised and checked by Sintef.

In 1998 NVE, EBL and Statnett SF made a mutual definition pamphlet connected to registration of fault and disconnections. This pamphlet was revised in 2001 and is based on international standards:

- IEC 50(191): International Electrotechnical Vocabulary, Dependability and quality of service
- EN 13306: Maintenance terminology
- EN 50160: Voltage Characteristics Of Electricity Supplied By Public Distribution Systems

3 A delivery point is a medium or high-voltage end-user or a distribution transformer.

- IEEE Standard Terms for Reporting and Analyzing Outage Occurence and Outage States of Electrical Transmission Facilities (IEEE Std 859-1987)

Every year NVE audit the network companies reporting of interruption data in several ways:

- unannounced visits to some of the network companies (interruption data must be stored for 10 years)
- comparing data from different sources (fault statistics, annual accounts etc)
- each utility has to give NVE the name of the person responsibel for the FASIT-system in the company.

Data collected annually (by NVE):

- Long interruptions of the supply voltage (> 3 minutes)
- Incident location (> 1 kV)
- Energy not supplied (ENS) because of capacity constraints in the transmission networks.
- Key figures for each delivery point connected to the main grid, the regional grid or the distribution networks (overhead, mixed or cable networks):
  - number of interruptions,
  - interruption duration [h],
  - energy not supplied (ENS) [MWh],
  - divided in to notified and non-notified interruptions.
- ENS is reported for 26 different customer groups; households, agriculture, health and social, manufacturing of wood products, iron and steel, commodity trade, public administration, education etc.
- Incident location - voltage level
  * 1-22 kV: [1,33>
  * 33-110 kV: [33,110]
  * 132 kV: <110,150]
  * 220-300 kV: <150,350]
  * 420 kV: <350>
- Name of company responsible for the ENS – this is only network companies with revenue caps.

Data related to faults in the HV and EHV network (>35 kV) is collected annually by the TSO (mandatory reporting).
Data related to faults in the MV (and LV) network (<35 kV) is collected annually by the EBL (voluntary reporting).

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